WHITESTONE SOLAR FARM

Volume 6: Environmental Statement

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Annex Number	Appendix Title
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Glossary

Term	Meaning
Environmental Statement (ES)	Environmental Statement which presents the environmental information relating to the Proposed Development and assessment of potential effects. The ES has been prepared as part of the Application.
Order Limits	Maximum extent of the Proposed Development comprising the Site, highway works and Cable Corridors.
The Applicant	Whitestone Net Zero Ltd
The Application	The Application will be submitted to the Secretary of State for Energy Security and Net Zero for a Development Consent Order.
The Proposed Development	The proposed Whitestone Solar Farm.
The Site	The land planned to be used for solar PV array and associated infrastructure, BESS, substation, and landscaping and habitat enhancement. The Site is split into W1, W2, and W3
Point of Connection	The new National Grid substation at Long Lane (Long Lane 400kV Substation) where the Proposed Development would connect to the National Grid.

Term	Meaning
Solar PV infrastructure	Solar PV arrays and supporting infrastructure
Whitestone 1 (W1)	The northern parcels of the Whitestone Solar Farm.
Whitestone 2 (W2)	The middle parcels of the Whitestone Solar Farm.
Whitestone 3 (W3)	The southern parcels of the Whitestone Solar Farm.

Acronyms

Acronym	Meaning
AGL	Above Ground Level
ALP	Approved layout plan
ANO	Air Navigation Order
ATCT	Air traffic control tower
BRE	British Research Establishment
CAA	Civil Aviation Authority
Draft ES	Environmental Statement
EIA	Environmental Impact Assessment
ES	Environmental Statement
FAA	Federal Aviation Authority
HFOV	Horizontal field-of-view
NPPG	National Planning Policy Guidance
NSIP	Nationally Significant Infrastructure Project
PRoW	Public Rights of Way
oPRoWMP	Outline Public Right of Way Management Plan
PV	Photovoltaic
SGHAT	Solar Glare Hazard Analysis Tool
VFOV	Vertical field-of-view
W1	Whitestone 1
W2	Whitestone 2
W3	Whitestone 3
ZTV	Zone of theoretical visibility

Units

Units	Meaning
cm	Centimetres
km	Kilometres
m	Metres
W	Watts

16.2 Glint and Glare Report

Introduction

16.2.1 This Appendix of the Environmental Statement ('ES') presents the findings of an assessment of the glint and glare as a result of the Proposed Development during operation and maintenance. Impacts during construction and decommissioning phases have been scoped out, as presented in **ES Volume 2, Chapter 16: Other Environmental Topics [EN0110020/APP/6.16]**.

16.2.2 This Appendix begins with a description of the relevant guidance and best practice assessment methods used, followed by an overview of the relevant baseline conditions, and sensitive receptors. It then evaluates the effects of the Proposed Development during its operation. The assessment has been undertaken in a staged approach, with ERM completing the initial assessment and preparation of the report, and Pager Power subsequently undertaking further detailed assessment of those receptors identified as having the potential for significant glare effects. Where additional analysis has been undertaken by Pager Power, this is signposted throughout the discussion. Throughout the design process, the likely significant environmental impacts have been carefully considered.

Legislation, Policy and Guidance

16.2.3 In the United Kingdom (UK) there is no formal prescriptive guidance on the methodology for conducting assessments of glint and glare effects on ground-based receptors. The available UK guidance is reviewed below as well as international guidance.

National Policy Statement for Renewable Energy Infrastructure (EN-3), Adopted 2025[1]

16.2.4 Sections 2.10.95 to 2.10.98 state that applicants should first undertake a qualitative review of receptors to identify potential glint and glare effects and determine whether a detailed assessment is required. Where necessary, quantitative assessment should consider the geometric potential, duration, angle and intensity of reflections, with the scope proportionate to the site and design, including tracking panels where proposed. The combined reflectivity of panels, frames and supports may also be considered, although reflections from frames and supports are generally minor.

16.2.5 Sections 2.10.126 to 2.10.128 also mention that applicants should consider mitigation measures to reduce solar glare, including the use of anti-glare or anti-reflective panel coatings, which may be required by the Secretary of State, as well as screening between panels and sensitive receptors. Where feasible, adjustments to panel azimuth or tilt within economically viable limits may also be used to alter the angle of incidence; while unlikely to remove effects entirely, such measures may assist in mitigating impacts in marginal cases.

16.2.6 Sections 2.10.150 and 2.10.151 states in relation to aviation infrastructure (including aircraft flight paths) "*Whilst there is some evidence that glint and glare from solar farms can be experienced by pilots and air traffic controllers in certain*

conditions, there is no evidence that glint and glare from solar farms results in significant impairment on aircraft safety. Therefore, unless a significant impairment can be demonstrated, the Secretary of State is unlikely to give any more than limited weight to claims of aviation interference because of glint and glare from solar farms".

National Planning Policy Guidance (NPPG) on Renewable and Low Carbon Energy (UK)[2]

16.2.7 Paragraph 013 (Reference ID: 5-013-20150327) sets out planning considerations that relate to large scale ground-mounted solar PV farms, namely that the deployment of large-scale solar farms can have a negative impact on the rural environment. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively. Considerations to be taken into account by local planning authorities are:

- "*The proposal's visual impact, the effect on landscape of glint and glare and on neighbouring uses and aircraft safety";* and
- *"The extent to which there may be additional impacts if solar arrays follow the daily movement of the sun.*"

Planning Guidance for the Development of Large-Scale Ground Mounted Solar PV Systems[3]

16.2.8 The British Research Establishment (BRE) document 'Planning Guidance for the Development of Large-Scale Ground Mounted Solar PV Systems'[4], states:

"*Glint may be produced as a direct reflection of the sun in the surface of the solar PV panel. It may be the source of the visual issues regarding viewer distraction. Glare is a continuous source of brightness, relative to diffused lighting. This is not a direct reflection of the sun, but rather a reflection of the bright sky around the sun. Glare is significantly less intense than glint.*

Solar PV panels are designed to absorb, not reflect, irradiation. However, the sensitivities associated with glint and glare, and the landscape/ visual impact and the potential impact on aircraft safety, should be a consideration. In some instances, it may be necessary to seek a glint and glare assessment as part of a planning application. This may be particularly important if 'tracking' panels are proposed as these may cause differential diurnal and/or seasonal impacts.

The potential for solar PV panels, frames and supports to have a combined reflective quality should be assessed. This assessment needs to consider the likely reflective capacity of all of the materials used in the construction of the solar PV farm."

16.2.9 This document is intended to provide best-practice planning guidance in respect of how large ground mounted arrays are developed setting out planning considerations and requirements. It is important to note that this document specifically relates to the planning policy framework permitted development and fees regulations for England.

Interim CAA Guidance – Solar Photovoltaic Systems (2010)[5]

16.2.10 There is little guidance on the assessment of glint and glare from solar farms with regards to aviation safety. The Civil Aviation Authority (CAA) have published interim guidance on 'Solar Photovoltaic Systems', and they also intend to undertake a review of the potential impacts of solar PV developments upon aviation, however this is yet to be published.

16.2.11 The interim guidance identifies the key safety issues with regards to aviation, including "*glare, dazzling pilots leading them to confuse reflections with aeronautical lights*." It is outlined that solar farm developers should be aware of the requirements to comply with the Air Navigation Order (ANO), published in 2009. In particular, developers should take cognisant of the following articles of the ANO8, including:

- "*Article 137 – Endangering safety of an aircraft – A person must not recklessly or negligently act in a manner likely to endanger an aircraft, or any person in an aircraft*";
- Article 221 - Lights liable to endanger – "*A person must not exhibit in the United Kingdom any light which:*
  - a) *by reason of its glare is liable to endanger aircraft taking off or from landing at an aerodrome; or*
  - *b) by reason of its liability to be mistaken for an aeronautical ground light liable to endange*r aircraft";
- Article 222 – Lights which dazzle or distract – "*A person must not in the United Kingdom direct or shine any light at any aircraft in flight so as to dazzle or distract the pilot of the aircraft*."

US Federal Aviation Administration (FAA) Guidance

(Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports 2013)[6]

16.2.12 This policy recommends undertaking technical assessments using the Solar Glare Hazard Analysis Tool (SGHAT) as a standard and approved methodology for assessing potential impacts on aviation interests, although other assessment methods may be considered. The SGHAT tool is the software model used in this assessment.

16.2.13 This policy provides a quantitative threshold in that a solar development will not automatically receive an objection on glint and glare grounds if low intensity glare is visible to pilots. Low intensity glint or glare with a low potential to form a temporary after-image would be considered acceptable under US guidance. Therefore, and given the lack of legislation and guidance within England quantifying acceptable effects, the US guidance has been followed in the methodology employed as part of this assessment.

Technical Guidance for Evaluating Selected Solar Technologies on Airports (2018)[7]

16.2.14 A final policy from the FAA (Policy Document 86 FR 25801, FAA, 2021) encourages airport developers to conduct ocular analysis of the potential impact for glint and glare, but notes that the FAA is withdrawing a previous interim policy

that the SGHAT is the only FAA approved tool for measuring the ocular impact of solar PV systems on receptors and acknowledges that there are several tools available for such assessment.

Doncaster Local Plan (2021)[8]

16.2.15 Policy 59: 'Low Carbon and Renewable Energy' of the Doncaster Local Plan aims to increase the supply of low carbon and renewable energy generated in the Borough. In all cases, low carbon and renewable energy proposals will be supported where they:

- *"3. allow the continued safe and efficient operation of Doncaster Sheffield Airport;"*
- *"4. would have no unacceptable adverse effects on highway safety and infrastructure;"*

2.2.1 More detailed information regarding the above legislation, policy and guidance can be found in **ES Volume 3, Appendix 16.1: Legislation, Policy and Guidance [EN0110020/APP/6.20]**.

Glint and Glare Definitions

Description

16.2.16 This assessment is concerned with the potential irritant and hazard effects of glint and glare from the proposed solar panels in relation to ground-based receptors such as residential receptors and transport users (road and rail), as well as aviation receptors. In the Technical Guidance for Evaluating Selected Solar Technologies on Airports (FAA, 2018)[9], the terms 'Glint' and 'Glare' are defined as:

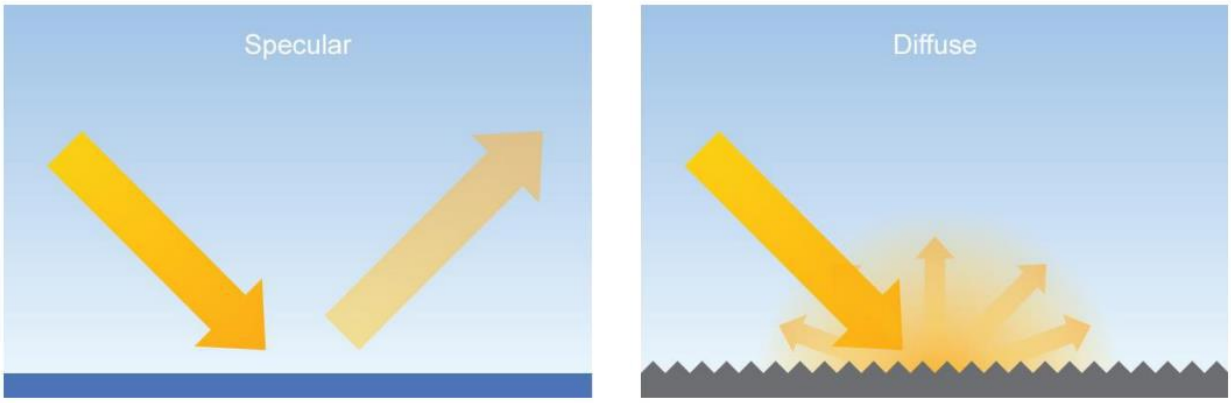
- Glint – "A momentary flash of bright light"; and
- Glare – "A continuous source of bright light".

16.2.17 These two effects can cause a brief loss of vision, also known as flash blindness, which is defined in the FAA guidance (2018) as "*generally, a temporary visual interference effect that persists after the source of illumination has ceased*."

Nature of Reflection

16.2.18 Photovoltaic solar panels are by no means a highly reflective surface, as they are designed to absorb sunlight and not to reflect it. However, as solar panels have flat, smooth surfaces they do reflect a certain concentrated amount of sunlight back to the receiver (receptor). This is 'specular' reflection. The more polished a surface is, the more it shines. 'Diffused' reflection occurs on rough or uneven surfaces and, therefore, the light is not seen as bright (see **Plate 2.1** below).

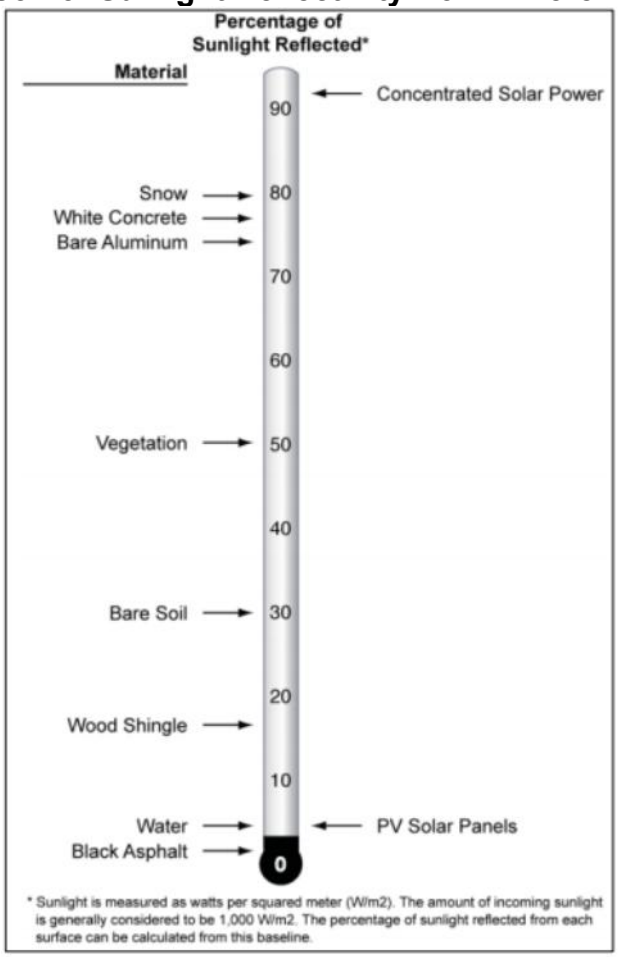
Plate 2.1: Specular vs Diffuse Reflection (Extracted from the FAA Technical Guidance, 2018)



16.2.19 Solar PV panels have similar reflective characteristics as water, which is much lower than the likes of glass, steel, snow and white concrete by comparison (see

16.2.20 **Plate** 2.2 below). Similar levels of reflectance can be found in common situations in rural environments, for example from polytunnels and wet road surfaces, etc.

Plate 2.2: Comparison of Sunlight Reflectivity from Different Surfaces



Receptors Types

Overview

16.2.21 As noted above there are several receptors included within the assessment of the potential impacts of glint and glare. There is no formal guidance on the maximum distance for which the impacts of glint and glare should be assessed, and there is, in a technical sense, no maximum distance for potential reflections. However, it is noted that with increased distance, the horizontal and vertical extent within which a reflecting area is seen reduces in an observer's field of vision. In addition, screening elements, including atmospheric conditions, within the intervening landscape are more likely to obstruct an observer's vision at longer distances.

Residential Dwellings

16.2.22 The greatest potential for impacts by glint and glare is likely to occur at receptors nearest to the source of reflectance. This is due to decreased likelihood of intervening screening elements, and a more limited horizontal and vertical extent of reflecting area within observer's field of vision, at locations further from the source of reflectance. To balance these factors, and in line with industry best-practice, a 1 km Study Area is used to identify residential receptors. This can be seen in **ES Volume 3, Figure 16.2.1 - 16.2.3 [EN0110020/APP/6.19]** The receptor height is 2 m, which represents the typical eye level for an observer at a ground-floor window.

16.2.23 Where there are several residential receptors within close proximity to each other, a representative dwelling or dwellings is/are chosen as the receptor for full assessment as the impacts will not vary to any significant degree. Where receptors occur in clusters, those located at either end of the cluster have been assessed in detail, and the worst-case impacts are attributed to that receptor.

Roads and other Ground-Based Transport Receptor

16.2.24 Similar to residential receptors, the greatest potential for substantial impacts by glint and glare on roads and other ground-based transport routes are likely to occur in closest proximity to the source of reflectance. Therefore, the same 1 km Study Area is used to assess the potential for glint and glare effects on ground-based transport receptors (see **ES Volume 3, Figures 16.2.1 – 16.2.3 [EN0110020/APP/6.19]**).

16.2.25 Following industry best practice, with regards to road users, a receptor height of 1.5 m was employed as this is typical of eye level. Rail driver's eye level was assumed to be 2.75 m above the rail for signal signing purposes and therefore this is the height used for assessment purposes. Horse rider eye level has been assumed to be 2.5 m above ground level (AGL) for Public Right of Way (PRoW) receptors as a worst case.

16.2.26 Where moving ground-based receptors are assessed, receptor points are placed every 200 m to account for variations in conditions and levels of glare along the routes (for both roads and PRoWs).

Aviation Assets

16.2.27 There is no prescribed Study Area within which aviation effects must be modelled within the formal guidance. For impact assessment purposes, relevant impacts from glare arise in relation to aviation safety, when the solar farm lies in close proximity to a runway, and in particular when an aircraft is descending to land. Study Areas to identify and assess aviation receptors will vary depending on the type of receptor identified. Assessments are generally required for large international aerodromes within 20km, military aerodromes within 10km, and smaller aerodromes within 5km.

Assessment Methodology and Impact Criteria

16.2.28 This section sets out the scope and methodology for the assessment of the impacts of the Proposed Development on glint and glare during the operation and maintenance phase.

16.2.29 Glint and glare is essentially the reflection of sunlight from reflective surfaces. The geometric analysis method employed in this assessment uses the known movements of the sun across the sky to predict when sunlight will reflect off a fixed surface (in this case the solar panel) towards a fixed receptor (e.g. residential receptor). The sun moves across the sky daily and its path in the sky changes throughout the year. This results in a different reflection or level of reflection throughout the year.

16.2.30 This assessment uses a multi-step process of elimination to determine which receptors have the potential to experience the effects of glint and glare. It then examines, using a computer-generated geometric model, the times of the year and the times of the day such effects could occur. Multiple parameters are included within the geometric analyses run, and these include, but are not limited to:

- The apparent position and height of the sun at a particular time of day and year (for every minute of the year);
- The position, height, orientation & pitch of the solar PV array; and
- The position and height of the receptor.

16.2.31 The solar reflection in the model is considered to be specular as a worst-case scenario. In reality, the light from the sun will not be fully reflected as solar panels are designed to absorb light rather than reflect it. Section 16.2.17 above outlines the reflective properties of a solar panel and compares it to other reflective surfaces, such as water, steel, and glass.

16.2.32 In addition, modern solar PV panels generally include a slight surface texture which should have a small effect on diffusing the light. However, this has not been included in the modelled results upon which this assessment is based, to ensure the worst-case scenario assessment.

16.2.33 The SGHAT has been used as the default and accepted industry standard tool for considering glint and glare effect in receptors. The SGHAT website describes the tool as follows[10]:

"This tool determines when and where solar glare can occur throughout the year from a user-specified PV array as viewed from user-prescribed observation points. The potential ocular impact from the observed glare is also determined".

2.2.2 The Federal Aviation Authority (FAA) has endorsed the SGHAT, developed by Sandia Laboratories in the US, "*as the standard for measuring the ocular impact of any proposed solar energy system on a federally-obligated airport*".

16.2.34 The primary output from the SGHAT is a report indicating the time of the day and days per year that glare may potentially occur. The output plots also indicate the intensity of the glare and whether it is harmful to human vision.

Proposed Development Description - Relevant Parameters Considered as Part of the Analysis

16.2.35 As described in **ES Volume 1, Chapter 5: The Proposed Development [EN0110020/APP/6.5]** and the **Outline Design Parameters [EN0110020/APP/7.3],** the Proposed Development would comprise south-facing, fixed solar PV modules at an angle of between 8 and 25 degrees. The proposed maximum height of the top of the solar PV modules would be 3.8 m AGL. Given that there are distances beyond 1 km of the panels between different sections of the Proposed Development, this report refers to the divided areas of Whitestone 1 (W1), Whitestone 2 (W2), and Whitestone 3 (W3). Solar PV modules would be bifacial, meaning both faces of the modules would have the capacity to absorb sunlight. Solar PV modules would be black, blue, or dark grey in colour with an anti-reflective coating.

Assumptions, Exclusions and Limitations

16.2.36 Below is a list of assumptions and limitations of the model and methods used within this report:

- All results from the geometric Glint and Glare Analysis conducted are theoretical as they assume that the sun is always shining at its fullest intensity. Therefore, any of the results shown in this analysis do not account for different weather conditions that frequently occur;
- The results of the analysis do not automatically consider obstacles between the receptors points and the solar panels, such as trees, vegetation, hills, buildings, etc.; and
- The model does not consider the detailed geometry of the Proposed Development; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results.

16.2.37 Due to these assumptions and limitations the model overestimates the number of minutes of glint and glare which are possible at each receptor and presents the worst-case scenario. Where glare is predicted further visibility analysis of receptors identified as theoretically experiencing occurrences of glare is conducted, considering the visibility of the solar panels from the receptor's location. If the panels are not visible from the receptor, then no reflection can occur.

Assessment of Magnitude of Impact

16.2.38 The assessment of glint and glare effects presented in this appendix is formed of three parts:

- Stage 1 - Bare Earth Analysis – based on a bare-earth scenario where no screening elements (e.g. hedgerows, buildings) have been taken into account;
- Stage 2 - Detailed Assessment – a more detailed assessment of individual receptors experiencing levels of glare of a Bare Earth Magnitude of Impact of High and Medium. This more detailed assessment includes analysis of existing landscape features (i.e. existing treelines/hedgerows), as well as proposed mitigation (i.e. landscape planting included in **ES Volume 3, Figure 5.1: Illustrative Masterplan [EN0110020/APP/6.19]**); and
- Stage 3 - Residual impact assessment – receptors identified as having a moderate impact or higher in the detailed assessment are re-assessed considering additional mitigation identified and a resultant residual impact presented).

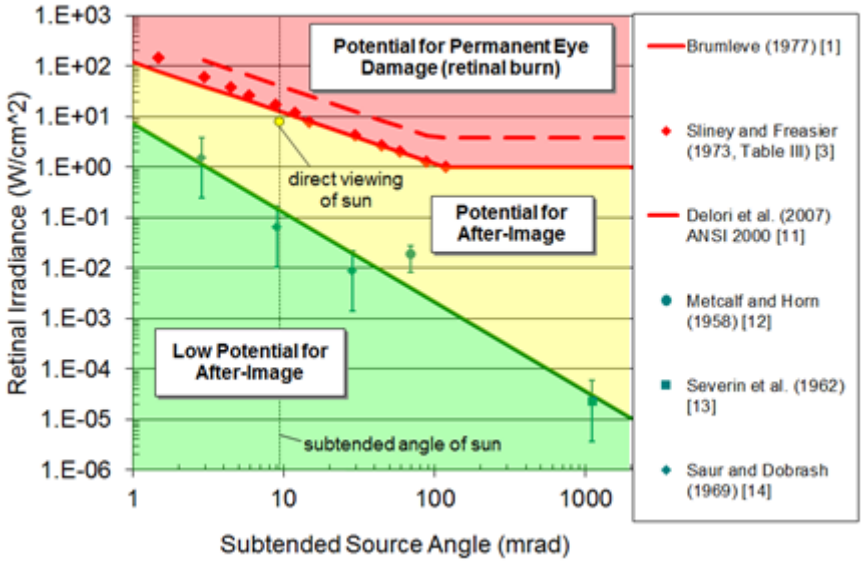
16.2.39 The determination of the likely impacts is based on a number of factors, including levels of screening present on the ground, and the orientation of receptors in relation to the Proposed Development. However, a preliminary determination is made using the outputs provided by the SGHAT. As seen in **Annex A: Glare Analysis**, the SGHAT plot is coloured according to a legend that indicates the intensity of the glare per period and whether it is harmful to human vision. This industry-standard glare analysis tool evaluates the occurrence of glare on a minute-by-minute basis and quantifies the ocular impact of solar glare into three categories:

- Green - low potential to cause after-image (flash blindness);
- Yellow - potential to cause temporary after-image; and
- Red - potential to cause retinal burn (permanent eye damage).

16.2.40 These categories assume a typical blink response in the observer. Note that retinal burn is not possible for PV glare to cause since PV modules do not focus reflected sunlight.

16.2.41 Green glare does not need to be considered when looking at ground based and some aviation receptors. Green glare does not cause temporary flash blindness and happens at an instant with very slight disturbance. As per FAA guidelines, mitigation is only required for green glare when affecting an Air Traffic Control Tower, but not for when affecting pilots. Therefore, it can be assumed that green glare is acceptable for ground-based receptors.

Plate 2.3: Extract from "Methodology to Assess Potential Glint and Glare Hazards from Concentrating Solar Power Plants: Analytical Models and Experimental ""Validation", ASME J. Sol. Energy Eng., 133



16.2.42 The plot outputs provided by the SGHAT (see **Annex A: Glare Analysis**) have been used to make a preliminary determination of whether glare will potentially occur in relation to the receptors identified below in the Baseline Conditions section. The modelling software outputs a hazard plot for each receptor predicted to be impacted by glare from the PV array. An orange dot is plotted for each minute of glare indicating the irradiance (power density) of the solar reflections. A yellow dot is plotted to show the irradiance of the Sun when it is viewed directly.

16.2.43 As mentioned, there is no specific guidance covering the magnitude of impact from solar reflections. In the event that the potential for yellow glare to occur is highlighted in the SGHAT outputs, the Applicant has established categories of effect as a guide. These categories are solely related to the theoretical amount of time a receptor may potentially experience glare. The final determination of impact is based on additional considerations such as the orientation of receptors (which determines if glint and glare is possible), intervening screening elements such as vegetation and buildings, and professional judgement.

Static Receptors (Buildings and Residential Receptors)

16.2.44 There is no specific guidance identifying the magnitude of impact from solar reflections on ground-based static receptors. However, the following criteria has been adopted for the purposes of this assessment and has been utilised and accepted across many solar developments within the UK and Ireland, including Nationally Significant Infrastructure Projects (NSIPs).

Table 16.2.1: Magnitude of Impact from Glare on Static Receptors

Criteria	Description
High	Glare of over 30 hours per year or over 30 minutes per day.

Medium	Glare of between 20 and 30 hours per year or between 20 and 30 minutes per day
Low	Glare of up to 20 hours per year or up to 20 minutes per day
None	No theoretical potential for glare based on geometric calculations or where the receptor is screened by intervening screening elements (i.e. landform, vegetation, or built infrastructure)

Moving Receptors (Road and Rail)

16.2.45 No specific guidance is available to identify the magnitude of impact from solar reflections on moving receptors except in aviation. The FAA guidance states that for a solar PV development to obtain FAA approval or to receive no objection, the following criteria must be met:

- No potential for glare (glint) or "low potential for after-image" along the final approach path for any existing or future runway landing thresholds (including planned or interim phases), as shown by the approved layout plan (ALP).

16.2.46 Azimuthal view angle describes the horizontal field-of-view (HFOV) (left and right) of observers traveling along a route. FAA research has found that the impact of glare beyond 50° horizontal field-of-view for pilots is mitigated.[11] It is assumed for the purposes of this assessment that this also applies to road and rail receptors.

16.2.47 To summarise, the magnitude of impact on moving receptors (road and rail) will be determined according to whether there is a potential to cause temporary after-image (i.e. red or yellow glare), and if that glare is seen within the drivers field of view (i.e. within 50 degrees either side of their line of sight).

16.2.48 The type of receptors is also considered relevant for the magnitude of impact occurring as a result of glare, as follows:

- Where no glare, or green glare occurs on all receptor types, the magnitude of impact will be **None**, according to best-practice and the relevant guidance in relation to driver safety;
- Where yellow or red glare occurs on a Local road, the magnitude of impact will be **Low**; and
- Where yellow or red glare occurs on a Motorway, major national, national and regional road, as well as on rail receptors, the magnitude of impact will be **High**.

Moving Receptors (PRoW)

16.2.49 In line with industry practice, glare should be avoided where possible, but it is generally considered that significant impacts upon pedestrians on a PRoW or riders on bridleways are not possible. The typical density of pedestrians and riders is low in a rural environment. There are few safety hazards associated with reflections towards an observer on a footpath or bridleway, and any resultant effect is much less serious than, for example, on the road network. Also, pedestrians or horses have more freedom to move beyond the solar reflection with little impact upon safety or amenity.

16.2.50 The magnitude of impact on PRoWs from glare is categorised as follows:

- Where no glare or green glare occurs, the magnitude of impact will be **None;** and
- Where yellow or red glare occurs, the magnitude of impact will be **Low**, given the mitigating factors noted in the previous paragraph.

Moving Receptors (Aviation)

Approach Paths

16.2.51 Each final approach path which has the potential to receive glare is assessed using the SGHAT model. The model assumes an approach bearing on the runway centreline, a 3-degree glide path with the origin 15.24 m above the runway threshold.

16.2.52 The model considers the pilot's field of view. The horizontal field of view (HFOV) refers to the extents of the pilot's horizontal field of view measured in degrees left and right from directly in front of the cockpit. The vertical field of view (VFOV) refers to the extents of the pilot's vertical field of view measured in degrees from directly in front of the cockpit. The HFOV is modelled at 50 degrees left and right from the front of the cockpit whilst the VFOV is modelled at 30 degrees.

16.2.53 The FAA guidance states that there should be no potential for glare or 'low potential for after image' at any existing or future planned runway landing thresholds for the scheme to be acceptable.

16.2.54 The magnitude of impact on approach paths from glare is categorised as follows:

- Where no glare or green glare occurs, the magnitude of impact will be **None;** and
- Where yellow or red glare occurs, the magnitude of impact will be **High.**

Air Traffic Control Tower (ATCT)

16.2.55 It is essential that air traffic controllers have a clear unobstructed view of aviation activity. The key areas in an aerodrome are the views towards the runway thresholds, taxiways and aircraft bays.

16.2.56 The FAA guidance states that no solar reflection towards the ATCT should be produced by a proposed solar development, however, this should be assessed on a site-by-site case and will depend on the operations at a particular aerodrome.

16.2.57 In order to determine the impact on the ATCT, the location and height of the tower will need to be fed into the SGHAT model and where there is a potential for 'low potential for After-Image' or more, then mitigation measures will be required.

16.2.58 The magnitude of impact on ATCTs from glare is categorised as follows:

- Where no glare the magnitude of impact will be **None;** and
- Where green, yellow or red glare occurs, the magnitude of impact will be **High.**

Pager Power Assessment

16.2.59 Initial analysis was undertaken by ERM using the ForgeSolar model. For selected receptors, further modelling was completed by Pager Power using their proprietary model and, and in the case of aviation receptors also the ForgeSolar

model. This additional assessment is discussed where relevant within this chapter.

16.2.60 As part of the detailed assessment, Pager Power undertook further assessment on all residential, road, and aviation receptors that were considered as still at risk of potential impacts of glare from the proposed PV arrays. Pager Power assessment comprised the following elements:

- Geometric modelling results (prior to consideration of screening);
- Desk-based review of identified screening;
- Consideration of relevant mitigating factors, where appropriate; and
- Predicted impact significance.

16.2.61 As part of the assessment, Pager Power applied their own industry recognised methodology for assigning impact significance ratings, which are presented **Annex B: Pager Power – Road and Residential Receptors and Annex C: Pager Power – Aviation Receptors**. These ratings have been used in the relevant sections of the detailed assessment.

Baseline Conditions

16.2.62 This section of the report lists the receptors that are considered within the baseline for the purposes of this Glint and Glare Report.

Residential Receptors

16.2.63 Residential receptors located within 1km of areas classified as potential solar panels have been identified (**Table 16.2.2**, **Table 16.2.3**, and **Table 16.2.4** (see **ES Volume 3, Figure 16.2 Residential and Transport Receptors [EN0110020/APP/6.19]**)). Glare was assumed to be possible if the receptor is located within the 1 km **Study Area** shown on **ES Volume 3, Figure 16.2: Residential and Transport Receptors [EN0110020/APP/6.19]**, and the Zone of Theoretical Visibility (ZTV) as outlined in detail in **ES Volume 2, Chapter 7: Landscape and Visual Impact Assessment [EN0110020/APP/6.7]** In addition, within the terrain of the Study Area**,** it is not geometrically possible for glare to occur directly to the north of south facing, fixed frame panels and therefore receptors located directly to the north of the proposed south facing panels are not included within the assessment.

Table 16.2.2: Residential Receptors - W1

Receptor	Easting	Northing
1	451555	394781
2	451727	394828
3	451848	394880
4	451366	394748
5	451181	394739
6	450188	395080
7	449456	395869
8	449385	395990

Receptor	Easting	Northing
9	449398	396040
10	448327	395853
11	448303	396627
12	448229	396674
13	448327	396879
14	448366	396934
15	448446	397001
16	448466	397040
17	449610	397127
18	449494	397297
19	449556	397496
20	449653	397587
21	450510	397510
22	450790	397043
23	451274	397567
24	451290	397494
25	451431	397430
26	451921	397214
27	451888	397406
28	451851	397465
29	451893	396536
30	451878	396408
31	451953	396279
32	452079	395222
33	450591	395891
34	450503	394179
35	452687	397098
36	451999	394863
37	451884	396321
38	451864	396428

Table 16.2.3: Residential Receptors - W2

Receptor	Easting	Northing
1	449851	390995
2	449332	390820
3	448422	390951

Receptor	Easting	Northing
4	448337	390913
5	448435	390816
6	448496	390775
7	448485	390618
8	448491	390498
9	448697	390444
10	448477	390275
11	448548	390032
12	448776	389750
13	448309	389802
14	448114	389996
15	448269	389906
16	448563	390215
17	449603	389568
18	445100	388981
19	444914	388720
20	445176	388143
21	445948	387490
22	445437	386858
23	445185	386909
24	444100	387426
25	443879	387361
26	443822	387596
27	443695	387860
28	443463	388113
29	443604	388244
30	443576	388345
31	443612	388393
32	444114	388435
33	443423	388581
34	447600	389064
35	448337	387635
36	448434	387516
37	448987	387306
38	448206	387487
39	448018	387371
40	448680	386472

Receptor	Easting	Northing
41	448510	386353
42	448140	386309
43	448116	385752
44	447643	385488
45	447527	385341
46	447123	385456
47	446297	385817
48	446216	385886
49	446002	386011
50	445829	386211
51	445675	386592
52	445548	386691
53	445521	386754
54	446486	387096
55	446530	387275
56	446570	387411
57	446631	387524
58	446610	387581
59	446824	387626
60	446564	387527
61	446476	387582
62	446389	387577
63	445892	388923
64	445187	389167
65	445793	389097
66	449872	387652
67	449961	387677
68	450112	387803
69	450222	387684
70	450644	387482
71	451030	387243
72	450975	386861
73	449661	386228
74	450798	385605
75	450228	385673
76	450050	385573
77	449829	385443

Receptor	Easting	Northing
78	450269	385095
79	449830	384950
80	449618	385207
81	449578	384929
82	449516	384688
83	449223	385369
84	449139	385583
85	448149	386424
86	449149	386879
87	451077	385373
88	451123	385277
89	451380	385171
90	451462	385065
91	451510	384904
92	451588	384751
93	451636	384622
94	451534	384502
95	451608	384329
96	451538	384213
97	451469	384100
98	451418	384047
99	451341	383862
100	451453	383585
101	451418	383486
102	451351	383400
103	449807	383950
104	449862	384145
105	449827	384388
106	449765	384523
107	449605	384552

Table 16.2.4: Residential Receptors - W3

Receptor	Easting	Northing
1	448105	381213
2	448287	380719
3	449184	381259

Receptor	Easting	Northing
4	449481	381362
5	449360	381301
6	449532	381439
7	448940	380693
8	449019	380368
9	449188	380158
10	449157	380041
11	449237	381045
12	449295	380858
13	449327	380621
14	446766	380678
15	446943	380437
16	446956	380167
17	447983	379298
18	448094	379207
19	448508	379332
20	447936	378536
21	449278	379366
22	448075	380314
23	448166	380444
24	449034	380467
25	449078	380559
26	446956	380379
27	448205	381003
28	448193	381210
29	448232	380901

Road and Rail Receptors

16.2.64 There are road and rail receptors within the 1 km Study Area that require a detailed Glint and Glare Assessment (see **ES Volume 3, Figures 16.2.1 – 16.2.3 [EN0110020/APP/6.19]**). There are also some minor roads which serve dwellings; however, these are not considered further as vehicle users of these roads will likely be travelling at low speeds, and therefore, there is a negligible risk of safety impacts resulting from glint and glare of the Proposed Development.

16.2.65 **Table 16.2.5**, **Table 16.2.6** and **Table 16.2.7** below show a list of the road and rail routes located within the Study Area and indicate where glare is assumed to be possible (see **ES Volume 3, Figure 16.2.1 – 16.2.3 [EN0110020/APP/6.19]**).

Glare was assumed to be possible if the receptor is located within the 1 km Study Area, and the ZTV, as outlined in detail in **ES Volume 2, Chapter 7: Landscape and Visual Impact Assessment [EN0110020/APP/6.7]**. In addition, within the terrain of the Study Area, as described in **ES Volume 2, Chapter 7 - Landscape and Visual Impact Assessment [EN0110020/APP/6.7]**, it is not geometrically possible for glare to occur directly to the north of south facing, fixed frame panels and therefore receptors located directly to the north of the proposed south facing panels are not included within the assessment. Roads and streets located within urban environments, with buildings and other infrastructure located in the intervening space between the proposed panels and the road, are not included as any visibility of panels will be screened from view by the buildings.

Table 16.2.5: Road Receptors - W1

Receptor No.	Road Name	Glint and Glare Possible (Receptor Located within ZTV)
Route 1	M18	Yes
Route 2	A630	No
Route 3	B6093	Yes
Route 4	B6376, Greaves Sike Lane and Ruddle Lane	Yes
Route 5	Arbour Lane	Yes

16.2.66 Given the scale of W2, the road and rail receptors located within the Study Area often cross in and out of the Study Area multiple times, and different sections of these routes are assessed in relation to different panel areas within W2 in the analysis shown in **Annex A: Glare Analysis**. Therefore, different sections of these roads are assigned different receptor numbers below in **Table 16.2.6**, with these different receptor numbers, and the sections of the road or rail receptors that they represent, shown on **ES Volume 3, Figure 16.2.2: Residential and Transport Receptors – W2 [EN0110020/APP/6.19]**. The different sections of road or rail receptor are split into sections related to the specific area of W2 in relation to which they are assessed. These areas of W2 (labelled as A, B, C, etc.) are shown on **ES Volume 3, Figure 16.2.2: Residential and Transport Receptors – W2 [EN0110020/APP/6.19]**.

Table 16.2.6: Road and Rail Receptors - W2

Receptor No.	Road Name	Glint and Glare Possible (Receptor Located within ZTV)
W2 - A		
Route 1A	M18	Yes
Route 2A	Morthen Road	Yes
W2 - B		
Route 1B	Long Lane, High Hazel Road, and B6067	Yes
Route 2B	A618	Yes

Receptor No.	Road Name	Glint and Glare Possible (Receptor Located within ZTV)
Route 3B	Reservoir Road	Yes
Route 4B	Midland Main Railway Line	Yes
W2 - C		
Route 1C	M1	Yes
Route 2C	A618	Yes
Route 3C	Reservoir Road	Yes
Route 4C	B6067	Yes
Route 5C	A57	Yes
Route 6C	M18	Yes
W2 - D		
Route 1D	M1	Yes
Route 2D	M18	Yes
Route 3D	B6060	Yes
Route 4D	A57	Yes
Route 5D	B6463	Yes
Route 6D	South Yorkshire Joint Railway Line	Yes
W2 - E		
Route 1E	A57	Yes
Route 2E	B6463	Yes
Route 3E	South Yorkshire Joint Railway Line	Yes

Table 16.2.7: Road and Rail Receptors - W3

Receptor No.	Road Name	Glint and Glare Possible (Receptor Located within ZTV)
Route 1	A618	Yes
Route 2	M1	Yes
Route 3	Killamarsh Lane and Woodall Lane	Yes
Route 4	Hard Lane and Winney Lane	Yes

PRoW Receptors

16.2.67 There are PRoW receptors within the 1 km Study Area that require a Glint and Glare Assessment. However, as noted previously in the Assessment Methodology and Impact Criteria section, there is little safety hazard associated with reflections towards an observer on a footpath or bridleway, and any

resultant effect is much less serious than, for example, on the road network. Also, pedestrians or horses have more freedom to move beyond the solar reflection with little impact upon safety or amenity. There is a negligible risk of safety impacts resulting from glint and glare of the Proposed Development on PRoW users.

16.2.68 **Table 16.2.8**, **Table 16.2.9**, and **Table 16.2.10** below list the PRoWs located within the Study Area (as shown on **ES Volume 3, Figure 16.2.4 – 16.2.6 [EN0110020/APP/6.19]**), and indicate where glare is assumed to be possible. Glare was assumed to be possible if the receptor is located within the 1 km Study Area, and the ZTV, as outlined in detail in **ES Volume 2, Chapter 7: Landscape and Visual Impact Assessment [EN0110020/APP/6.7]**. In addition, within the relatively flat terrain of the Study Area, it is not geometrically possible for glare to occur directly to the north of south facing, fixed frame panels and therefore receptors located directly to the north of the proposed panels are not included within the assessment. PRoWs located within urban environments, or heavily forested areas, with trees, buildings and other infrastructure located in the intervening space between the proposed panels and the PRoW, are not included as any visibility of panels will be screened from view by the buildings or trees.

Table 16.2.8: PRoW Receptors - W1

Receptor No.	Glint and Glare Possible (receptor located within ZTV, and not within urban environments, or heavily forested areas)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes

16.2.69 As is the case with road and rail receptors, given the scale of W2, the PRoW receptors located within the Study Area often cross in and out of the Study Area multiple times, and different sections of these routes are assessed in relation to

different panel areas within W2 in the analysis shown in **Annex A: Glare Analysis**. Therefore, different section of these routes are assigned different receptor numbers below in **Table 16.2.9**, with these different receptor numbers, and the sections of the PRoW receptors that they represent, shown on **ES Volume 3, Figure 16.2.5: PRoW Receptors – W2 [EN0110020/APP/6.19]**. The different sections of road or rail receptor are split into sections related to the specific area of W2 in relation to which they are assessed. These areas of W2 (labelled as A, B, C, etc.) are shown on **ES Volume 3, Figure 16.2.2: Residential and Transport Receptors – W2 [EN0110020/APP/6.19]**

Table 16.2.9: PRoW Receptors - W2

Receptor No.	Glint and Glare Possible (receptor located within ZTV, and not within urban environments, or heavily forested areas)
W2 - A	
1A	Yes
2A	Yes
3A	Yes
4A	Yes
5A	Yes
W2 - B	
1B	Yes
2B	Yes
3B	No
4B	No
5B	Yes
W2 - C	
1C	Yes
2C	Yes
3C	Yes
4C	Yes
5C	Yes
6C	Yes
7C	Yes
8C	No
9C	Yes
W2 - D	
1D	Yes
2D	Yes
3D	Yes

Receptor No.	Glint and Glare Possible (receptor located within ZTV, and not within urban environments, or heavily forested areas)
4D	Yes
W2 - E	
1E	Yes
2E	Yes
3E	No
4E	No

Table 16.2.10: PRoW Based Receptors - W3

Receptor No.	Glint and Glare Possible (receptor located within ZTV, and not within urban environments, or heavily forested areas)
1	Yes
2	Yes
3	No
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	Yes
11	Yes
12	No
13	No

Aviation Assets

16.2.70 There is no prescribed Study Area within which aviation effects must be modelled within the formal guidance. For impact assessment purposes, relevant impacts from glare arise in relation to aviation safety, when the solar farm lies in close proximity to a runway, and in particular when an aircraft is descending to land. Study Areas to identify and assess aviation receptors will vary depending on the type of receptor identified. Assessments are generally required for large international aerodromes within 20km, military aerodromes within 10km, and smaller aerodromes within 5km. **Table 16.2.11** below lists the aerodromes found within 20km of the Proposed Development.

Table 16.2.11: Aerodromes within 20km of the Proposed Development

Aerodrome	Distance from the Proposed Development	Type
Netherthorpe Airfield	4.6 km	Small Licensed Aerodrome
Coal Aston Airstrip	9 km	Small Unlicensed Aerodrome
Doncaster Sheffield Airport	12 km	International Airport (currently closed and the airspace surrounding the airport is uncontrolled airspace as of December 2022).[12]

16.2.71 Both the Netherthorpe Airfield and Doncaster airport have been brought forward for detailed assessment. Netherthorpe is a small, licensed aerodrome is located 4.6 km from W3 and is assessed below in relation to these panels. The aerodrome has two grass runways, details of which are included below in

16.2.72 . There is no Air Traffic Control Tower (ATCT) present at the aerodrome.

16.2.73 It is noted that Doncaster Sheffield Airport has received funding at the time of writing, to reopen from 2027. Given the timing of the announcement of the reopening of this airport, the respective runways have been included in the assessment and details can be found below in **Table 16.2.12**.

Table 16.2.12: Netherthorpe Airfield Runway Physical Characteristics[12]

Runway Designation	Bearing	Length (m)	Width (m)
06	055.40	553	36
24	235.41	553	36
18	174.80	382	18
36	354.80	382	18

Table 16.2.13: Doncaster Airfield Runway Physical Characteristics[13]

Runway Designation	Bearing	Length (m)	Width (m)
02	018	2894	60
20	198	2894	60

Impact Assessment

Stage 1 - 'Bare Earth' Analysis Results

Residential Receptors

16.2.74 **Table 16.2.13**, **Table 16.2.15**, and **Table 16.2.16** below list the results of the bare earth Glint and Glare Analysis conducted for residential receptors identified above in the Baseline Conditions section, based on a bare-earth scenario where no screening elements (e.g. hedgerows, buildings) have been taken into account. The results of the analysis is summarised here and can be viewed in full in **Annex A: Glare Analysis**.

Table 16.2.14: Bare Earth Glint and Glare Results - Residential Receptors - W1

Receptor	Maximum Duration of Glare Per Day in a No-Screening Scenario (in minutes)	Hours Per Year of Glare in a No-Screening Scenario	Bare Earth Magnitude of Impact (based on either minutes per day or hours per year)	Worst Case Tilt
1	32	29.1	High	8
2	29	38.1	High	8
3	26	41.5	High	8
4	25	5.9	Medium	8
5	0	0	None	N/A
6	38	45.9	High	8
7	40	42.8	High	8
8	32	60.6	High	25
9	34	65.4	High	25
10	12	21.1	Medium	25
11	20	29.7	Medium	25
12	18	20.9	Medium	25
13	22	8	Medium	25
14	19	4.9	Low	25
15	16	2.2	Low	25
16	12	0.5	Low	25
17	44	73.9	High	25
18	13	0.9	Low	25
19	0	0	None	N/A
20	0	0	None	N/A
21	0	0	None	N/A
22	33	42.1	High	25

Receptor	Maximum Duration of Glare Per Day in a No-Screening Scenario (in minutes)	Hours Per Year of Glare in a No-Screening Scenario	Bare Earth Magnitude of Impact (based on either minutes per day or hours per year)	Worst Case Tilt
23	0	0	None	N/A
24	0	0	None	N/A
25	0	0	None	N/A
26	0	0	None	N/A
27	0	0	None	N/A
28	0	0	None	N/A
29	60	128.2	High	8
30	88	158.2	High	8
31	98	139.1	High	8
32	768	80.9	High	8
33	42	897.8	High	8
34	0	0	None	N/A
35	0	0	None	N/A
36	25	40.4	High	8
37	81	151.8	High	8
38	79	158.5	High	8

Table 16.2.15: Bare Earth Glint and Glare Results - Residential Receptors - W2

Receptor	Maximum Duration of Glare Per Day in a No-Screening Scenario (in minutes)	Hours Per Year of Glare in a No-Screening Scenario	Bare Earth Magnitude of Impact (based on either minutes per day or hours per year)	Worst Case Tilt
1	20	36.4	High	25
2	78	97.5	High	25
3	8	0.7	Low	25
4	12	4.2	Low	25
5	12	9.8	Low	25
6	12	26	Medium	25
7	18	37.3	High	8
8	19	47.5	High	8
9	9	19	Low	8
10	18	39.9	High	8

Receptor	Maximum Duration of Glare Per Day in a No-Screening Scenario (in minutes)	Hours Per Year of Glare in a No-Screening Scenario	Bare Earth Magnitude of Impact (based on either minutes per day or hours per year)	Worst Case Tilt
11	16	4.3	Low	8
12	0	0	None	NA
13	0	0	None	NA
14	14	12.9	Low	8
15	15	11.5	Low	8
16	21	37	High	8
17	0	0	None	NA
18	28	3.2	Medium	8
19	44	34	High	25
20	63	130.8	High	8
21	74	78.3	High	8
22	39	28.4	High	25
23	0	0	None	NA
24	39	68.8	High	8
25	35	62.2	High	25
26	38	46.4	High	25
27	57	78.6	High	25
28	65	87.7	High	25
29	65	106.9	High	25
30	66	84.3	High	25
31	35	62.2	High	8
32	20	59	High	8
33	31	51.4	High	25
34	21	6.7	Low	8
35	76	99.5	High	8
36	87	98.8	High	8
37	91	162.2	High	8
38	64	87.9	High	8
39	34	83.2	High	8
40	81	31.2	Medium	25
41	43	40.3	High	25
42	39	56.9	High	25
43	18	32.4	High	8

Receptor	Maximum Duration of Glare Per Day in a No-Screening Scenario (in minutes)	Hours Per Year of Glare in a No-Screening Scenario	Bare Earth Magnitude of Impact (based on either minutes per day or hours per year)	Worst Case Tilt
44	0	0	None	NA
45	0	0	None	NA
46	0	0	None	NA
47	0	0	None	NA
48	0	0	None	NA
49	14	1.2	Low	8
50	59	41.6	High	8
51	87	91.7	High	8
52	36	53.7	High	25
53	24	26.8	Medium	25
54	115	291.6	High	8
55	25	57.5	High	8
56	29	75.3	High	8
57	24	62.1	High	8
58	23	57.1	High	8
59	27	67.6	High	8
60	25	62.7	High	8
61	23	57.6	High	8
62	22	56.8	High	8
63	34	89.7	High	8
64	0	0	None	NA
65	11	18.5	Low	25
66	13	13.3	Low	25
67	13	8.2	Low	25
68	0	0	None	NA
69	10	0.6	Low	25
70	13	9.3	Low	25
71	13	12.7	Low	25
72	13	21.7	Medium	25
73	23	17.2	Medium	25
74	12	16.5	Low	25
75	17	31.4	High	8
76	0	0	None	NA

Receptor	Maximum Duration of Glare Per Day in a No-Screening Scenario (in minutes)	Hours Per Year of Glare in a No-Screening Scenario	Bare Earth Magnitude of Impact (based on either minutes per day or hours per year)	Worst Case Tilt
77	17	6.6	Low	8
78	13	25.4	Medium	25
79	0	0	None	NA
80	0	0	None	NA
81	0	0	None	NA
82	19	42.9	High	25
83	25	22.6	Medium	8
84	34	71.1	High	8
85	13	2.4	Low	8
86	28	46	High	25
87	11	17.7	Low	25
88	20	52.5	High	8
89	15	28.1	Medium	8
90	19	50.3	High	8
91	24	58.8	High	8
92	21	50.1	High	8
93	27	35.5	High	8
94	12	17.2	Low	25
95	12	25.5	Medium	25
96	14	28.4	Medium	25
97	19	24.6	Medium	8
98	16	16.5	Low	8
99	0	0	None	NA
100	0	0	None	NA
101	0	0	None	NA
102	0	0	None	NA
103	22	29.1	Medium	8
104	21	40	High	8
105	21	47.7	High	8
106	24	55.4	High	8
107	25	54.8	High	8

Table 16.2.16: Bare Earth Glint and Glare Results - Residential Receptors - W3

Receptor	Maximum Duration of Glare Per Day in a No-Screening Scenario (in minutes)	Hours Per Year of Glare in a No-Screening Scenario	Bare Earth Magnitude of Impact (based on either minutes per day or hours per year)	Worst Case Tilt
1	22	41	High	25
2	0	0	None	N/A
3	46	26.8	High	8
4	22	55.8	High	8
5	22	47.2	High	8
6	21	50	High	8
7	35	56.6	High	8
8	40	53.2	High	8
9	45	67.5	High	8
10	48	73.6	High	8
11	16	12.9	Low	25
12	15	5.5	None	25
13	23	10.9	Medium	25
14	36	47.1	High	8
15	50	58.3	High	8
16	43	49.9	High	25
17	13	10.8	Low	8
18	0	0	None	N/A
19	48	61.6	High	8
20	0	0	None	N/A
21	32	55.1	High	25
22	36	90.1	High	8
23	33	68	High	25
24	30	54.5	High	8
25	34	55.9	High	8
26	46	52.9	High	8
27	21	30.4	High	25
28	26	43.4	High	25
29	16	5.8	Low	8

Road and Rail Receptors

16.2.75 **Table 16.2.17**, **Table 16.2.18** and **Table 16.2.19** below list the results of the bare earth Glint and Glare Analysis conducted for road and rail receptors identified above in the Baseline Conditions section, based on a bare-earth scenario where no screening elements (e.g. hedgerows, buildings) have been taken into account. The results of the analysis is summarised here and can be viewed in full in **Annex A: Glare Analysis**. The magnitude of impact is determined by the criteria set out in the Assessment Methodology and Impact Criteria section above.

Table 16.2.17: Bare Earth Glint and Glare Results - Road and Rail Receptors - W1

Receptor	Worst-Case Type of Glare Occurring	Road Type	Bare Earth Magnitude of Impact	Worst Case Tilt
Route 1	Yellow	Motorway	High	25
Route 3	None	Local	None	N/A
Route 4	Yellow	Local	Low	8
Route 5	Yellow	Local	Low	25

Table 16.2.18: Bare Earth Glint and Glare Results - Road and Rail Receptors - W2

Receptor	Worst-Case Type of Glare Occurring	Road Type	Bare Earth Magnitude of Impact	Worst Case Tilt
W2 - A				
Route 1A	None	Motorway	None	N/A
Route 2A	None	Local	None	N/A
W2 - B				
Route 1B	Yellow	Local	Low	25
Route 2B	Yellow	National	High	8
Route 3B	Yellow	Local	Low	25
Route 4B	Yellow	Railway	High	8
W2 - C				
Route 1C	Yellow	Motorway	High	8
Route 2C	None	National	None	N/A
Route 3C	Yellow	Local	Low	8
Route 4C	Yellow	Local	Low	25
Route 5C	Green	National	None	N/A
Route 6C	Yellow	Motorway	High	8
W2 - D				
Route 1D	Yellow	Motorway	High	8
Route 2D	Yellow	Motorway	High	8

Receptor	Worst-Case Type of Glare Occurring	Road Type	Bare Earth Magnitude of Impact	Worst Case Tilt
Route 3D	Yellow	Local	Low	8
Route 4D	Yellow	National	High	8
Route 5D	Yellow	Local	Low	25
Route 6D	None	Railway	None	N/A
W2 - E				
Route 1E	Yellow	National	High	25
Route 2E	None	Local	None	N/A
Route 3E	Yellow	Railway	High	8

Table 16.2.19: Bare Earth Glint and Glare Results - Road and Rail Receptors - W3

Receptor	Worst-Case Type of Glare Occurring	Road Type	Bare Earth Magnitude of Impact	Worst Case Tilt
Route 1	Yellow	National road	High	8
Route 2	Yellow	Motorway	High	8
Route 3	Yellow	Local road	Low	8
Route 4	Yellow	Local road	Low	8

PRoW Receptors

16.2.76 **Table 16.2.20**, **Table 16.2.21**, and **Table 16.2.22** below list the results of the bare earth Glint and Glare Analysis conducted for PRoW receptors identified above in the Baseline Conditions section, based on a bare-earth scenario where no screening elements (e.g. hedgerows, buildings) have been taken into account. The results of the analysis is summarised here and can be viewed in full in **Annex A: Glare Analysis**. The magnitude of impact is determined by the criteria set out in the Assessment Methodology and Impact Criteria section above.

Table 16.2.20: Bare Earth Glint and Glare Results - PRoW Receptors - W1

Receptor	Type of Glare Occurring	Bare Earth Magnitude of Impact	Worst Case Tilt
1	Yellow	Low	8
2	Yellow	Low	8
3	Yellow	Low	25
4	Yellow	Low	25
5	Yellow	Low	8

Receptor	Type of Glare Occurring	Bare Earth Magnitude of Impact	Worst Case Tilt
6	Yellow	Low	25
7	Yellow	Low	25
8	Yellow	Low	8
9	Yellow	Low	8
10	Yellow	Low	8
11	Yellow	Low	8
12	Yellow	Low	8
13	Yellow	Low	8
14	Yellow	Low	8
15	Yellow	Low	25

Table 16.2.21: Bare Earth Glint and Glare Results - PRoW Receptors - W2

Receptor	Type of Glare Occurring	Bare Earth Magnitude of Impact	Worst Case Tilt
W2 - A			
1A	Yellow	Low	25
2A	Yellow	Low	8
3A	None	None	N/A
4A	Yellow	Low	25
5A	Yellow	Low	25
W2 - B			
1B	Yellow	Low	8
2B	Yellow	Low	8
5B	Yellow	Low	25
W2 - C			
1C	Yellow	Low	8
2C	Yellow	Low	8
3C	Yellow	Low	8
4C	Yellow	Low	25
5C	Yellow	Low	25
6C	Yellow	Low	8
7C	Yellow	Low	8
9C	Yellow	Low	8
W2 - D			
1D	Yellow	Low	8
2D	Yellow	Low	8

Receptor	Type of Glare Occurring	Bare Earth Magnitude of Impact	Worst Case Tilt
3D	Yellow	Low	25
4D	None	None	N/A
W2 - E			
1E	Yellow	Low	8
2E	Yellow	Low	25

Table 16.2.22: Bare Earth Glint and Glare Results - PRoW Receptors - W3

Receptor	Type of Glare Occurring	Bare Earth Magnitude of Impact	Worst Case Tilt
1	Yellow	Low	8
2	Yellow	Low	8
4	Yellow	Low	8
5	Yellow	Low	8
10	Yellow	Low	8
11	Yellow	Low	8

16.2.77 No effects above Low or None are anticipated for PRoW, therefore they are not considered further in this assessment.

Aviation Receptors

16.2.78 **Table 16.2.23** and **Table 16.2.24** below list the results of the bare earth Glint and Glare Analysis conducted for aviation receptors identified above in the Baseline Conditions section, based on a bare-earth scenario where no screening elements (e.g. hedgerows, buildings) have been taken into account. The results of the analysis is summarised here and can be viewed in full in **Annex A: Glare Analysis**. The magnitude of impact is determined by the criteria set out in the Assessment Methodology and Impact Criteria section above.

Table 16.2.23: Aviation Receptors at Netherthorpe Airfield

Receptor	Green Glare (mins annually)	Yellow Glare (mins annually)	Red Glare (mins annually)	Bare Earth Magnitude of Impact	Worst Case Tilt
Runway 06	0	0	0	None	N/A
Runway 24	1603	925	0	High	8
Runway 18	0	0	0	None	N/A
Runway 36	0	0	0	None	N/A

Table 16.2.24: Aviation Receptors at Doncaster Airport

Receptor	Green Glare (mins annually)	Yellow Glare (mins annually)	Red Glare (mins annually)	Bare Earth Magnitude of Impact	Worst Case Tilt
Runway 02	0	0	0	None	N/A
Runway 20	0	0	0	None	N/A

Summary of Bare Earth Glare Analysis

16.2.79 The results presented above in the previous section detail the bare earth geometric analysis of the theoretical levels of glare possible for receptors surrounding the proposed panels, in a bare-earth scenario. The results do not account for visual screening elements already existing within the landscape, such as vegetation, buildings, and other infrastructure, which would obscure views of the panels giving rise to glare.

16.2.80 In relation to residential receptors, there are 91 no. receptor points (i.e. representative of either an individual residential receptor, or a group of receptors) with a Bare Earth Magnitude of Impact of High, and 18 no. receptor points with a Bare Earth Magnitude of Impact of Medium. This accounts for 109 out of 174 receptor points analysed which have a Bare Earth Magnitude of Impact of Medium or High. There are 32 no. receptor points with no glare, and 33 no. receptor point with a Bare Earth Magnitude of Impact of Low.

16.2.81 In relation to road and rail receptors, there are no instances of red glare occurring. There are 12 no. road or rail receptors with a Bare Earth Magnitude of Impact of High, indicating yellow glare with a potential to cause temporary after-image, including several stretches of the M1 and M18 motorways. There are 10 no. road or rail receptors with a Bare Earth Magnitude of Impact of Low, and 7 no. road or rail receptors with a Bare Earth Magnitude of Impact of None, including stretches of the M18 Motorway.

16.2.82 In relation to PRoW receptors, there are 41 no. receptors which are assessed as theoretically experiencing yellow glare, and consequently with a Bare Earth Magnitude of Impact of Low, following the rationale outlined in paragraphs 16.2.49 and 16.2.50. There are 2 no. PRoW receptors with a Bare Earth Magnitude of Impact of None, as no glare is predicted to occur for these receptors.

16.2.83 In relation to aviation receptors, of the four runways at Netherthorpe Airfield that were modelled, no glare was predicted to arise at Runways 6, 18, and 36. At Runway 24, 925 hours (annually) of yellow glare was predicted to occur. This is glare with a potential to cause temporary after-image. It is noted again in relation to the available FAA guidance, that for a solar PV development to obtain FAA approval or to receive no objection, there must be no potential for glare (glint) or *"low potential for after-image"* (i.e. green glare) along the final approach path for any existing or future runway landing thresholds.

Embedded Mitigation

16.2.84 Solar PV modules would be black, blue, or dark grey in colour with an anti-reflective coating, as mentioned within the **Outline Design Parameters [EN0110020/APP/7.3]**.

16.2.85 The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** has been prepared which proposes various screening methods (i.e. landscape planting), which are also fully described in **the outline Landscape and Ecological Management Plan [EN0110020/APP/5.13].**

Stage 2 - Detailed Assessment

16.2.86 The following section conducts a more detailed assessment of individual receptors experiencing levels of glare of a Bare Earth Magnitude of Impact of High and Medium. This more detailed assessment includes analysis of existing landscape features (i.e. existing treelines/hedgerows) informed through review of aerial and satellite imagery and collection of winter and summer photography. Whilst acknowledging not all existing vegetation is evergreen, there is considered sufficient density, notably in hedgerows and treelines, to provide screening even in winter. Stage 2 assessment also includes consideration of proposed mitigation (i.e. landscape planting included in the Illustrative Mitigation Masterplan, and presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**) to determine the actual levels of visibility of the proposed panels modelled as giving rise to glare in accordance with the potential magnitude of impact in **Table 16.2.1**. This is conducted using available street view and other imagery, as well as reference to the **ES Volume 3, Figure 5.1: Illustrative Masterplan [EN0110020/APP/6.19]**.

Whitestone 1 - Residential Receptors

16.2.87 **Residential Receptor 1:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a southern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.88 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from this location by existing intervening vegetation along the Proposed Development field boundaries. Note that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that hedgerow planting has been proposed in the intervening space here between the receptor and the panels, further restricting visibility. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.89 **Residential Receptor 2:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a southern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.90 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation immediately adjoining the receptors. Note that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that hedgerow planting has been proposed in the intervening space

here between the receptor and the panels further restricting visibility. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.91 **Residential Receptor 3:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a southern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.92 Views from a location to the right of this receptor in the direction of the panels, demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation immediately adjoining the receptors, as well as along the Proposed Development field boundaries. Note that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that hedgerow planting has been proposed in the intervening space here between the receptor and the panels further restricting visibility. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.93 **Residential Receptor 4:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a small southern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.94 Views from a location to the west of this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation immediately adjoining this receptor. In addition, from this location the same screening elements along the Proposed Development field boundaries noted in relation to Residential Receptors 1-3 above, also provide screening, beyond the existing roadside vegetation. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.95 **Residential Receptor 6:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that an eastern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.96 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation (e.g. existing and proposed hedgerows and other proposed solar panels) and smaller topographical rises. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.97 **Residential Receptor 7:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a central section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.98 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation (e.g. existing hedgerows) and smaller topographical rises. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.99 **Residential Receptor 8:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a central section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.100 Views from this receptor in the direction of the panels, demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation (e.g. existing vegetation immediately adjoining the receptor) and smaller topographical rises. The

Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicated that scattered tree planting is proposed between the receptor and the panels. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.101 **Residential Receptor 9:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a central section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.102 Views from this receptor in the direction of the panels, demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation (e.g. existing hedgerows) and smaller topographical rises. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.103 **Residential Receptor 10:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a central section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.104 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare will be mostly screened from view from this location by existing intervening vegetation and topographical features. However, there are some areas of panels that are likely to give rise to glare visible from this receptor. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that scattered tree and hedgerow planting has been proposed between the receptor and the panels. This will bolster existing screening provided by hedgerows bordering the fields. Therefore, on the basis of the planting proposed, and the existing partial screening of the panels giving rise to glare, the impact is reduced **to Low** in accordance with **Table 16.2.1**.

16.2.105 **Residential Receptor 11 and 12:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a northern section of W1 can potentially impact on the receptors represented by these receptor points.

16.2.106 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.107 **Residential Receptor 13:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a northern section of W1 can potentially impact on the receptors represented by these receptor points.

16.2.108 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by other buildings. Views from the eastern edge of the group of receptors here will be substantially / completely screened by a large topographical rise and area of woodland. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.109 **Residential Receptor 17:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a northern section of W1 can potentially impact on the receptors represented by these receptor points.

16.2.110 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by other buildings. Views from the eastern edge of the group of receptors here will be substantially / completely screened by a large

topographical rise and area of woodland. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.111 **Residential Receptor 22:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that two northern sections of W1 (east and west, two directions from the receptor) can potentially impact on the receptors represented by this receptor point.

16.2.112 Views eastwards from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by declining topography and scattered treelines. Similarly, views westwards from this receptor in the direction of the panels are screened by the rise in topography. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that hedgerow planting has been proposed in the intervening space between the receptor and the panels, just beyond the summit of the rise in topography. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.113 **Residential Receptor 29:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a northern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.114 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is partially screened from view from this location by local screening elements immediately adjoining the receptors. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that hedgerow and treeline planting has been proposed along the field borders to bolster existing screening. However, there may still be views from this receptor that will theoretically experience visible glare from the panels.

16.2.115 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the Proposed Development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day.

16.2.116 Existing vegetation is expected to restrict visibility of reflecting panels from ground-floor viewpoints, with only limited residual views anticipated from elevated positions. In addition, potential effects are reduced further by the fact that any reflections would largely coincide with periods of direct sunlight and would therefore be less perceptible. Taking these mitigating factors into account, the overall impact is assessed as **Low** using the Pager Power methodology.

16.2.117 **Residential Receptors 30 and 38:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a large central, northern and western section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.118 These receptor points are located on the same hill as receptor 29 above. There are a number of trees and other vegetation located on land immediately adjoining these receptors which will provide partial screening in this direction. There is proposed hedgerow and treeline planting along the near borders of these fields shown in the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** which will also provide partial screening of the panels located in these fields.

16.2.119 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the Proposed Development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.120 Existing vegetation is expected to restrict visibility of reflecting panels from ground-floor viewpoints, with only limited residual views anticipated from elevated positions. In addition, potential effects are reduced further by the fact that any reflections would largely coincide with periods of direct sunlight and would therefore be less perceptible. Taking these mitigating factors into account, the overall impact is assessed as **Low** using the Pager Power methodology**.**

16.2.121 **Residential Receptor 31:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a large central and northern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.122 Unlike receptors 30 and 38, receptors represented by this viewpoint are located setback from the steep topography of the hill which provides open views in the direction of the Proposed Development. This flatter topography, and various intervening screening elements such as existing vegetation and industrial buildings, substantially screen views towards the proposed panels giving rise to glare from this location.

16.2.123 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day. Existing buildings would substantially obstruct views of the reflecting panels, meaning that reflections are not expected to be visible in practice. As a result of this effective screening, the impact classification is assessed as **None** using the Pager Power methodology**.**

16.2.124 **Residential Receptor 37:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a large central and northern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.125 This receptor point is located on the same hill as receptor 29 above. There are a number of existing trees and other vegetation located immediately adjoining this receptor, which will provide partial screening in the direction of the panel giving rise to glare. There is proposed hedgerow and treeline planting along the near borders of these fields shown in the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** which will also provide partial screening of the panels located in these fields.

16.2.126 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the Proposed Development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at this receptor.

16.2.127 No existing or potential screening features were identified during the Pager Power assessment, indicating that reflecting panels may be visible from certain viewpoints at this receptor. However, the potential effects are reduced by the fact that any reflections would predominantly coincide with periods of direct sunlight,

therefore the perceptibility of the panels in practice is likely to be reduced. On this basis, the overall impact is classified as **Moderate** using the Pager Power methodology**.**

16.2.128 **Residential Receptor 32:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a southern and central section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.129 Views from a location to the right of this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location. The panels are screened by existing intervening vegetation immediately adjoining the receptors, as well as by a smaller topographical rise in elevation. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.130 **Residential Receptor 33:** This receptor is a series of farm sheds and uninhabited ruined buildings. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.131 **Residential Receptor 36:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a southern section of W1 can potentially impact on the receptors represented by this receptor point.

16.2.132 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by existing intervening vegetation along the adjoining roads and immediately adjoining the receptors. Therefore, the impact is reduced to **None** in accordance with **Table 26.2.25.**

16.2.133 **Table 26.2.25** below summarises the results of the detailed assessment for residential receptors of W1.

Table 26.2.25 Detailed Assessment Summary – Whitestone 1 Residential Receptors

Residential Receptor No.	Assessment Magnitude
1	None
2	None
3	None
4	None
6	None
7	None
8	None
9	None
10	Low
11	None
12	None
13	None
17	None
22	None
29	Low
30	Low

31	None
32	None
33	None
36	None
37	Moderate
38	Low

Whitestone 2 – Residential Receptors

16.2.134 **Residential Receptor 1:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northernmost section of W2A can potentially impact on the receptors represented by this receptor point.

16.2.135 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by vegetation bordering the property, although it is possible that some gaps in this existing vegetation may occur, there is also significant hedgerow planting proposed in the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**. However, given the relative height of the receptor in relation to the panels, on a precautionary basis, the impact is reduced to **Low** in accordance with **Table 16.2.1**.

16.2.136 **Residential Receptor 2:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern section (in two directions) of W2A can potentially impact on the receptors represented by this receptor point.

16.2.137 Views eastwards from this receptor in the direction of the panels demonstrate that other built infrastructure in the intervening space will prevent views of these panels. In addition, it is noted that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that hedgerow planting is proposed at the near edge of these panels, providing further screening of the panels giving rise to glare. Views westwards from this receptor in the direction of the panels demonstrate that a large cluster of trees will prevent visibility of the panels giving rise to glare in this direction. It is noted that **ES Volume 3, Figure 5.1: Illustrative Masterplan [EN0110020/APP/6.19]** provides that hedgerow planting is proposed at the near edge of these panels, providing further screening of the panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1.**

16.2.138 **Residential Receptor 6:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern section of W2A can potentially impact on the receptors represented by this receptor point.

16.2.139 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by the nearby roadside hedgerow, and the allotments on the far side of the road. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.140 **Residential Receptor 7:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central and northern

sections of W2A can potentially impact on the receptors represented by this receptor point.

16.2.141 As a result of the declining topography of the field adjacent to the receptors represented by this receptor location, there will likely be open views of the proposed panels giving rise to glare. It is noted that the Illustrative Masterplan provides that hedgerow planting is proposed at the near edge of some of the panels seen and throughout this area of panels, adjacent to PRoWs, providing partial screening of the panels giving rise to glare. However, given the topography and level of visibility presented here further assessment was undertaken.

16.2.142 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the Proposed Development are geometrically possible for periods extending beyond three months, although individual reflection events are predicted to last less than 60 minutes on any given day.

16.2.143 Existing vegetation is expected to partially obstruct views of the reflecting panels, though some residual visibility may remain where a direct line of sight is available. As reflections are anticipated to occur mainly during periods of direct sunlight, their perceptibility in practice is likely to be reduced. However, Pager Power have not deemed this sufficient to remove the significance of solar reflections. Taking these considerations into account, the predicted effect is assessed as **Moderate** using the Pager Power methodology.

16.2.144 **Residential Receptor 8:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central and northeastern sections of W2A can potentially impact on the receptors represented by this receptor point.

16.2.145 The northeastern area of panels giving rise to glare will be screened entirely by a large cluster of woodland. It is noted that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that hedgerow planting is proposed at the near edge of some of the panels seen and throughout this area of panels, adjacent to PRoWs, providing partial screening of the panels giving rise to glare. However, given the topography and level of visibility presented here, additional assessment was undertaken.

16.2.146 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for periods extending beyond three months, although individual reflection events are predicted to last less than 60 minutes on any given day.

16.2.147 Existing vegetation is expected to partially obstruct views of the reflecting panels, though some residual visibility may remain where a direct line of sight is available. As reflections are anticipated to occur mainly during periods of direct sunlight, their perceptibility in practice is likely to be reduced. However, Pager Power have not deemed this sufficient to remove the significance of solar reflections. Taking these considerations into account, the predicted effect is assessed as a **Moderate** using the Pager Power methodology.

16.2.148 **Residential Receptor 10:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southern section of W2A can potentially impact on the receptors represented by this receptor point.

16.2.149 Multiple treelines, hedgerows, and built infrastructure will prevent any views of the panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.150 **Residential Receptor 16:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southern section of W2A can potentially impact on the receptors represented by this receptor point.

16.2.151 Views from this receptor in the direction of the panels demonstrate that the area of panels giving rise to glare is substantially / completely screened from view from this location by roadside screening adjacent to this. In addition, multiple treelines, hedgerows, and built infrastructure will provide further screening in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1.**

16.2.152 **Residential Receptor 18:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northernmost section of W2B can potentially impact on the receptors represented by this receptor point.

16.2.153 As a result of the declining topography of the field adjacent to the receptors represented by this receptor point, there will likely be open views of the proposed panels giving rise to glare. Given the topography and level of visibility presented here, further assessment was undertaken

16.2.154 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for periods extending beyond three months, although individual reflection events are predicted to last less than 60 minutes on any given day.

16.2.155 Existing vegetation is expected to partially obstruct views of the reflecting panels, though some residual visibility may remain where a direct line of sight is available in the event that an 8° tilt is used on the panels. However, under the scenario in which a 25° tilt is used, these views are not predicted to occur in practice. For the 8° tilt scenario, any reflections are further mitigated by the fact that reflections predominantly coincide with periods of direct sunlight, originate at distances greater than approximately 800 m from the receptor, and do not affect windows of the dwelling as the façade that faces the development does not contain any. Taking these considerations into account, the predicted effect is assessed as **None** when using a 25° tilt, and **Low** when utilising an 8° tilt, in accordance with the Pager Power methodology.

16.2.156 **Residential Receptor 19:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northernmost section of W2B can potentially impact on the receptors represented by this receptor point.

16.2.157 As a result of the declining topography of the field adjacent to the receptors represented by this receptor point, there will likely be partial views of the proposed panels giving rise to glare. Given the topography and level of visibility presented here, further assessment was undertaken.

16.2.158 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.159 The desk-based review did not identify any existing or potential screening features, indicating that reflections could be visible where receptors have a direct

line of sight to the panels. While the potential effects are reduced by the fact that any reflections would predominantly coincide with periods of direct sunlight, making them less noticeable to receptors, the resulting effects are deemed significant. Taking these factors into account, the predicted effect is classified as a **Moderate** impact using the Pager Power methodology.

16.2.160 **Residential Receptor 20:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northernmost section of W2B and the northernmost section of W2C can potentially impact on the receptors represented by this receptor point.

16.2.161 There will be no external visibility from this receptor point due to the high level of existing vegetative screening surrounding the receptor. In addition, to the east towards the panels in W2C giving rise to glare, the rising topography in this direction will prevent any visibility of these panels. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.162 **Residential Receptor 21:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a large part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.163 As a result of the declining topography of the field adjacent to the receptors represented by this receptor point, there will likely be partial views of the proposed panels giving rise to glare. Given the topography and level of visibility presented here, further assessment was undertaken

16.2.164 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors)** indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.165 The desk based review did not identify any existing or potential screening features, indicating that reflections may be visible where a direct line of sight exists. However, potential effects are reduced by the fact that reflections would largely coincide with periods of direct sunlight and would originate from a distance of over 950 metres from the receptor, reducing their perceptibility. Taking these factors into account, the predicted impact is assessed as **Low** impact using the Pager Power methodology.

16.2.166 **Residential Receptor 22:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and southern parts of W2C can potentially impact on the receptors represented by this receptor point.

16.2.167 As a result of local topographical features, there will be no visibility of the proposed panels giving rise to glare. Therefore, the impact is **None** in accordance with **Table 16.2.1**.

16.2.168 **Residential Receptor 24:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southern part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.169 As a result of a small rise in topography adjacent to the receptor point, there will be no visibility of the proposed panels giving rise to glare. There is also substantial existing vegetative screening surrounding other receptors represented by this receptor point. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.170 **Residential Receptor 25:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southern part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.171 Similar to receptor point 24 above, the local rises in topography, in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.172 **Residential Receptor 26:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central and southern part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.173 Similar to receptor points 24 and 25 above, the local rises in topography, in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.174 **Residential Receptor 27:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and western part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.175 The local rises in topography, in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.176 **Residential Receptor 28:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and western part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.177 The local rises in topography, in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.178 **Residential Receptor 29:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and western part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.179 The local rises in topography, in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.180 **Residential Receptors 30 and 31:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and western part of W2B can potentially impact on the receptors represented by these receptor points.

16.2.181 The local rises in topography, and existing vegetation, in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.182 **Residential Receptor 32:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a central strip of W2B can potentially impact on the receptors represented by this receptor point.

16.2.183 There will be open visibility towards the panels giving rise to glare from this receptor. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that hedgerow planting is proposed in front of the proposed panels in the near field, which when established will provide substantial screening of the panels

giving rise to glare. Therefore, once the hedgerow planting has established, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.184 **Residential Receptor 33:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern part of W2B can potentially impact on the receptors represented by this receptor point.

16.2.185 The local rises in topography, and existing vegetation, in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.186 **Residential Receptor 35:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and central parts of W2C and W2D can potentially impact on the receptors represented by this receptor point. In relation to W2D, panels to the west and east (two directions) are giving rise to glare.

16.2.187 A tall treeline, seen in the direction of the proposed panels that give rise to glare from W2C, entirely screens views in this direction. This treeline will also screen views of the northwestern part of W2D giving rise to glare. Views from this receptor eastwards, towards the central part of W2D, demonstrate there is limited / partial visibility of some panels (in white) through gaps in the hedgerow adjacent to this receptor point. While there may be some partial views of panels in this direction, considering the overall level of existing screening in place for views towards the proposed panels for this property, the impact is reduced to **Low** in accordance with **Table 16.2.1**.

16.2.188 **Residential Receptor 36:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and central parts of W2C and W2D can potentially impact on the receptors represented by this receptor point. In relation to W2D, panels to the west and east (two directions) are giving rise to glare.

16.2.189 Multiple screening elements, including treelines and hedgerows bordering the intervening fields, in the direction of the proposed panels giving rise to glare in W2C, entirely screen views in this direction. In relation to W2D and panels to the west of the receptor, there will also be no visibility as a result of the existing intervening vegetation. Secondly, there is a small gap in the roadside hedgerow located in the intervening space between this receptor and the panels giving rise to glare. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that scattered trees are proposed to infill this gap. With this mitigation in place, there will be no visibility of the panels giving rise to glare in this direction. Therefore, the impact is **None** in accordance with **Table 16.2.1**.

16.2.190 **Residential Receptor 37:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central parts W2D can potentially impact on the receptors represented by this receptor point. Panels in two directions (east and west) give rise to glare in relation to this receptor.

16.2.191 Each of the residential receptors represented by this viewpoint have treelines and hedgerow bordering their properties, which will provide substantial screening to the west and east. There will be no visibility to the west from these receptors given the dense screening. To the east, the more scattered treeline will be supplemented by tree planting, as shown in the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**. With this mitigation planting, there will be no visibility of

panels giving rise to glare to the east. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.192 **Residential Receptor 38:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and central parts of W2C and W2D can potentially impact on the receptors represented by this receptor point.

16.2.193 To the west, a tall treeline in the direction of the proposed panels giving rise to glare, entirely screen views in this direction. Similarly, lines of hedgerows and treelines will also prevent views of the proposed panels in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.194 **Residential Receptor 39:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and central parts of W2C and W2D can potentially impact on the receptors represented by this receptor point.

16.2.195 In views to the east (towards W2D) the bank adjoining the motorway will prevent any views of the proposed panels in this direction. In views to the west (W2C), while there will be some partial screening provided by the panels giving rise to glare, there will be visibility of the panels remaining. Note that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that screening has been proposed in the intervening space here between the receptor and the Solar PV Modules giving rise to glare, restricting visibility. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.196 **Residential Receptor 40:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and central parts of W2C and W2D can potentially impact on the receptors represented by this receptor point.

16.2.197 There will be no visibility of the proposed panels giving rise to glare, as a result of a tall treeline bordering the receptor. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.198 **Residential Receptor 41:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and southern parts of W2C can potentially impact on the receptors represented by this receptor point.

16.2.199 As a result of the existing vegetation bordering the receptor, and intervening topographical features, there will be no visibility of the proposed panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.200 **Residential Receptor 42:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and southern parts of W2C can potentially impact on the receptors represented by this receptor point.

16.2.201 The tall vegetation bordering the intervening motorway will screen further views, preventing visibility of the proposed panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.202 **Residential Receptor 43:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the southern part of W2D can potentially impact on the receptors represented by this receptor point.

16.2.203 Views from this receptor point in the direction of the proposed panels giving rise to glare, show that while there are open views available, the local topographical rises in elevation seen in the background of the image, will screen any actual visibility of the panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1.**

16.2.204 **Residential Receptor 50:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the southern parts of W2C can potentially impact on the receptors represented by this receptor point.

16.2.205 The panels giving rise to glare will be visible from this location, with limited screening provided by existing intervening vegetation in the landscape. Therefore, further assessment was undertaken.

16.2.206 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors)** indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.207 Existing vegetation is expected to significantly restrict visibility of the reflecting panels from ground floor viewpoints, although some residual views may be possible from upper floors. Potential effects are further reduced as any reflections would coincide predominantly with periods of direct sunlight and would originate from a distance of over 600 metres from the receptor, limiting their perceptibility. On this basis, the predicted impact is assessed as **Low** using the Pager Power methodology.

16.2.208 **Residential Receptor 51:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and southern parts of W2C can potentially impact on the receptors represented by this receptor point.

16.2.209 The tall vegetation bordering the intervening road will screen further views, preventing visibility of the proposed panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.210 **Residential Receptors 52 and 53:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and southern parts of W2C can potentially impact on the receptors represented by this receptor point.

16.2.211 Roadside screening will provide screening in the direction of the proposed panels from the vast majority of receptors represented by this receptor point, with no visibility of the proposed panels occurring. However, there is one location from the area surrounding this receptor where partial views of the proposed panels giving rise to glare can occur. Despite this, the panels are substantially screened, and only the southernmost area of W2C is visible. Therefore, taking a precautionary approach, the impact is **Low** in accordance with **Table 16.2.1**.

16.2.212 **Residential Receptor 54:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and southern parts of W2C can potentially impact on the receptors represented by this receptor point.

16.2.213 Views towards the east, where proposed panels are giving rise to glare, are screened from view by existing roadside vegetation. It is also noted that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** has proposed scattered trees along the hedgerow, increasing the level of screening likely to occur. In views to the west, there is a small area of the southern part of W2C giving rise to

glare. However, there is no visibility of these panels as a result of the vegetation bordering the receptors, and hedgerows present in the intervening space. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.214 **Residential Receptor 55:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central part of W2C can potentially impact on the receptors represented by these receptor points.

16.2.215 The positioning of this receptor on the far side of a local rise in topography, as well as the hedgerows and treelines bordering this receptor, will screen visibility of the panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.216 **Residential Receptor 56:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central part of W2C can potentially impact on the receptors represented by this receptor point.

16.2.217 There is substantial existing vegetation surrounding the receptor point at this location, which will prevent external views in the direction of the proposed panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.218 **Residential Receptors 57 and 60:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central part of W2C can potentially impact on the receptors represented by these receptor points.

16.2.219 Views from the vicinity of receptor point 57 demonstrate that there will be open visibility of the panels giving rise to glare from this location, accounting for existing screening. It is noted that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** proposes a hedgerow with scattered trees located in a near field which when established will provide substantial screening of views in this direction. As a viewer moves westward from receptor point 57 towards receptor point 60, the built infrastructure and hedgerows begin to prevent views of the proposed panels. Therefore, on a precautionary basis, accounting for the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** the impact is reduced to **Low** in accordance with **Table 16.2.1**.

16.2.220 **Residential Receptor 58:** The 'Glare Reflections on the PV Footprint' charts shown **in Annex A: Glare Analysis**, shows that the central part of W2C can potentially impact on the receptors represented by this receptor point.

16.2.221 The receptor represented by receptor point 58 will have external views in the direction of the proposed panels entirely screened from view by the vegetation adjoining the receptor. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.222 **Residential Receptor 59:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central part of W2C can potentially impact on the receptors represented by this receptor point.

16.2.223 Views towards the nearest field where the proposed panels giving rise to glare are located demonstrate that there is open visibility from this receptor towards these panels. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** includes for a proposed hedgerow with trees to be planted in the intervening space. This proposed vegetative screening will substantially screen views in this direction, of the panels giving rise to glare. Therefore, once planting is established, the

impact is reduced to **None**, as there will be no, or very limited visibility of the proposed panels.

16.2.224 **Residential Receptors 61 and 62:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central part of W2C can potentially impact on the receptors represented by these receptor points.

16.2.225 The panels giving rise to glare on these receptors are located to the east. There are numerous screening elements in this direction which will prevent views in the direction of these panels, including built infrastructure within the settlement they are located in, trees, hedgerows, and other vegetation. There will be no visibility of the proposed panels giving rise to glare, from the receptors represented by these receptor points. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.226 **Residential Receptor 63:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern part of W2C can potentially impact on the receptors represented by this receptor point.

16.2.227 Views towards the fields are where the southernmost of the proposed panels giving rise to glare are located. The remainder of the panels giving rise to glare are screened by a local topographical rise. There will be very limited visibility of the panels giving rise to glare. Therefore, the impact is reduced to **Low** in accordance with **Table 16.2.1**.

16.2.228 **Residential Receptor 72:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern part of W2D can potentially impact on the receptors represented by this receptor point.

16.2.229 To the west (in the direction of the proposed panels), a large area of woodland prevents views further in this direction. There will be no visibility of the proposed panels from this receptor. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.230 **Residential Receptor 73:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the southern and central parts of W2D can potentially impact on the receptors represented by this receptor point.

16.2.231 In the direction of the proposed panels giving rise to glare, there is no visibility beyond the existing vegetation bordering the receptor. In addition, there are numerous hedgerows located in the intervening space which will also screen views of the proposed panels. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.232 **Residential Receptor 75:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the southern part of W2D can potentially impact on the receptors represented by this receptor point.

16.2.233 There is roadside screening present in the intervening road which runs adjacent to this receptor point. The screening bordering these properties, which will prevent views of the proposed panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.234 **Residential Receptor 78:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.235 There are generally open views from this location towards the proposed panels, with some of those visible giving rise to glare. There are various screening elements in the gardens of the residential receptors represented by this

viewpoint, which will further screen views of the proposed panels giving rise to glare.

16.2.236 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the Proposed Development are geometrically possible for periods extending beyond three months, although individual reflection events are predicted to last less than 60 minutes on any given day.

16.2.237 No significant or partial screening mitigates impacts at this receptor. As reflections are anticipated to occur mainly during periods of direct sunlight, their perceptibility in practice is likely to be reduced. However, Pager Power have not deemed this sufficient to remove the significance of solar reflections. Taking these considerations into account, the predicted effect is assessed as a **Moderate** impact in line with the Pager Power methodology.

16.2.238 However, the **Illustrative Masterplan** indicates that embedded mitigation in the form of landscape screening has been proposed in the intervening space here between the receptor and the Solar PV Modules giving rise to glare in the form of existing hedgerow enhancements, restricting visibility. Therefore, ERM predicts this impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.239 **Residential Receptor 82:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central and southwestern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.240 There are generally open views from this location towards the proposed panels, with some of those visible giving rise to glare. There are various screening elements in the gardens of the residential receptors represented by this viewpoint, which will further screen views of the proposed panels giving rise to glare. Therefore, further assessment has been undertaken.

16.2.241 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at this receptor.

16.2.242 Existing vegetation is expected to significantly restrict visibility of the reflecting panels from ground floor viewpoints, although some residual views may be possible from upper floors. Potential effects are further reduced as any reflections would coincide predominantly with periods of direct sunlight and would originate from a distance of over 600 metres from the receptor, limiting their perceptibility. On this basis, the predicted impact is assessed as **Low** using the Pager Power methodology.

16.2.243 **Residential Receptor 83:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southern part of W2D can potentially impact on the receptors represented by this receptor point.

16.2.244 There is substantial screening from treelines surrounding this receptor. This screening will prevent any visibility of the proposed panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.245 **Residential Receptor 84:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the southern part of W2D can potentially impact on the receptors represented by this receptor point.

16.2.246 There is substantial screening from treelines surrounding this receptor. This screening will prevent any visibility of the proposed panels giving rise to glare from the residential receptors represented by this receptor point. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.247 **Residential Receptor 86:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central part of W2D can potentially impact on the receptors represented by this receptor point. Panels in two directions (east and west) give rise to glare in relation to this receptor.

16.2.248 To the west, there will be no visibility of the panels giving rise to glare, as a result of multiple hedgerows screening visibility in this direction. To the east, similarly, the presence of hedgerows within the flat landscape will prevent any views of the panels giving rise to glare from this receptor. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.249 **Residential Receptor 88:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.250 There is a tall dense treeline present at the rear of the receptor represented by this viewpoint. This treeline is located in the intervening space between the receptor and the panels giving rise to the glare, located to the west. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1.**

16.2.251 **Residential Receptor 89:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.252 There is an open view across a number of fields from the roadway located in front of the residential receptors represented by this receptor point. There is some partial screening seen adjacent to the nearest field, in the form of a hedgerow with scattered trees. While this provides some partial screening of the fields beyond, there will be visibility of some of the panels giving rise to glare from this location. The majority of the panels indicated as giving rise to glare are located behind the rise in elevation seen in the far-right background. Therefore, further assessment has been undertaken.

16.2.253 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for periods exceeding three months, with individual reflection events lasting less than 60 minutes on any given day.

16.2.254 However, existing vegetation is predicted to significantly obstruct views of the reflecting panels, therefore views are not anticipated in practice. This receptor is not likely to be affected and reflections would not be perceptible, no mitigation is required. Based on these factors, the predicted effect is assessed as **None** using the Pager Power methodology.

16.2.255 **Residential Receptor 90:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.256 Views in the direction of the northern section of W2E are where the proposed panels giving rise to glare are located. The view in this direction is heavily screened by roadside vegetation, as well as hedgerows located in the fields beyond. There will be no visibility of the proposed panels giving rise to glare form this location. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.257 **Residential Receptor 91:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern and western parts of W2E can potentially impact on the receptors represented by this receptor point.

16.2.258 Views towards the northern part of W2E are where glare is occurring. There will be no views of these panels which are giving rise to glare, given the level of existing vegetation bordering intervening fields. While there are open views of the field where proposed panels of W2E are located in this direction, those giving rise to glare, which are located on the western extent of W2E, beyond the hill small topographical rise, will not be visible from this location. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.259 **Residential Receptor 92:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central and western parts of W2E can potentially impact on the receptors represented by this receptor point.

16.2.260 There are relatively open views towards the fields where the proposed panels giving rise to glare are located. There is some partial screening provided by the hedgerow and treelines seen bordering the far edge of the nearest field. However, further assessment has been undertaken.

16.2.261 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.262 The Pager Power review did not identify any existing or potential screening features, suggesting that reflections may be visible where receptors have an unobstructed line of sight to the panels. While the potential effects are reduced by the fact that any reflections would predominantly coincide with periods of direct sunlight, making them less noticeable to receptors, the resulting effects are deemed significant. Overall, the predicted impact is assessed as **Moderate** using the Pager Power methodology.

16.2.263 **Residential Receptor 93:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central and western parts of W2E can potentially impact on the receptors represented by this receptor point.

16.2.264 There are relatively open views towards the fields where the proposed panels giving rise to glare are located. There is some partial screening provided by the hedgerow and treelines seen bordering the far edge of the nearest field. However, further assessment has been undertaken.

16.2.265 Further analysis from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.266 The Pager Power review did not identify any existing or potential screening features, suggesting that reflections may be visible where receptors have an unobstructed line of sight to the panels. While the potential effects are reduced by the fact that any reflections would predominantly coincide with periods of direct sunlight, making them less noticeable to receptors, the resulting effects are deemed significant. Overall, the predicted impact is assessed as **Moderate** using the Pager Power methodology.

16.2.267 **Residential Receptor 95:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.268 There is some screening present around the receptors represented by this receptor point. It can be seen from a review of aerial imagery that there are multiple tall features located in the intervening space between these receptors and the proposed panels giving rise to glare. Therefore the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.269 **Residential Receptors 96 and 97:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southern part of W2E can potentially impact on the receptors represented by these receptor points.

16.2.270 There are likely to be relatively open views from the receptors represented by these receptor points, towards the panels located in the southern part of W2E. It can be seen from the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** that a proposed hedgerow with trees is proposed in front of the nearest panels to these receptors, which will provide complete / substantial screening of the panels giving rise to glare, once in place. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.271 **Residential Receptor 103:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southeastern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.272 Views towards the southeastern area of panels are giving rise to glare in this location. Although, it can be seen that while other panels of W2E will be visible those giving rise to glare are screened by a local topographical feature. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.273 **Residential Receptor 104:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the southeastern and a small central part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.274 Similar to the above, the southeastern area of panels which are giving rise to glare on this location are screened from view by a topographical rise in elevation. The small central part of W2E giving rise to glare is still partially visible above the rise in elevation. However, further assessment has been undertaken.

16.2.275 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at this receptor.

16.2.276 Intervening terrain is expected to partially restrict visibility of the reflecting panels from this receptor. Potential effects are further reduced as any reflections would coincide predominantly with periods of direct sunlight and would originate from a distance of over 700 metres from the receptor, limiting their perceptibility. Additionally, the windows of this dwelling do not face the reflecting areas. On this basis, the predicted impact is assessed as **Low** using the Pager Power methodology.

16.2.277 **Residential Receptor 105:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern, central, and

southern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.278 There will be no visibility of the proposed panels giving rise to glare as a result of the same topographical features in the near fields as the previous two receptor points. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.279 **Residential Receptor 106:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the northern, central, and southern part of W2E can potentially impact on the receptors represented by this receptor point.

16.2.280 There will be some partial visibility of the easternmost extent of the proposed panels of W2E. With the majority of the panels giving rise to glare screened from view by intervening topography and hedgerows bordering the intervening fields. Therefore, the impact is reduced to **Low** in accordance with **Table 16.2.1**.

16.2.281 **Residential Receptor 107:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the central and southwestern parts of W2E can potentially impact on the receptors represented by this receptor point.

16.2.282 There are generally open views from this location towards the proposed panels, with some of those visible giving rise to glare. There are various screening elements in the gardens of the residential receptors represented by this viewpoint, which will further screen views of the proposed panels giving rise to glare. However, further assessment has been undertaken.

16.2.283 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.284 However, the Pager Power review confirms that existing vegetation and buildings are predicted to significantly obstruct views of the reflecting panels, meaning that reflections are not expected to be visible in practice. As a result, the predicted impact classification is assessed as **No Impact** using the Pager Power methodology.

16.2.285 **Table 16.2.26** below summarises the results of the detailed assessment reported above for residential receptors of W2.

Table 16.2.26: Detailed Assessment Summary – Whitestone 2 Residential Receptors

Residential Receptor No.	Assessment Magnitude
1	Low
2	None
6	None
7	Moderate
8	Moderate
10	None
18	None / Low

Residential Receptor No.	Assessment Magnitude
19	Moderate
20	None
21	Low
22	None
24	None
25	None
26	None
27	None
28	None
29	None
30	None
31	None
32	None
33	None
35	Low
36	None
37	None
38	None
39	None
40	None
41	None
42	None
43	None
50	Low
51	None
52	Low
53	Low
54	None
55	None
56	None
57	Low
58	None
59	None
60	Low
61	None
62	None
63	Low

Residential Receptor No.	Assessment Magnitude
72	None
73	None
75	None
78	Moderate
82	Low
83	None
84	None
86	None
88	None
89	None
90	None
91	None
92	Moderate
93	Moderate
95	None
96	None
97	None
103	None
104	Low
105	None
106	Low
107	None

Whitestone 3 – Residential Receptors

16.2.286 **Residential Receptors 1 and 28:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a small section of the northern part of W3 can potentially impact on the receptors represented by these receptor points.

16.2.287 Views from a location at this receptor location in the direction of these panels, demonstrate that the area of panels giving rise to glare is visible over a flat landscape, with an open view towards the first field where the panels giving rise to glare are proposed, and a more limited view, partially screened by an existing line of vegetation, to the more eastern field where panels giving rise to glare are located. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that hedgerow planting is proposed in front of the proposed panels in the near field, which when established will provide substantial screening of the panels giving rise to glare. Until the planting is established, there will be visibility of panels giving rise to glare, when planting is established the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.288 **Residential Receptor 3:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the western half of the northern part of W3 can potentially impact on the receptors represented by this receptor point.

16.2.289 The area of panels giving rise to glare is visible from this receptor point across lower lying fields. There are some existing hedgerows and treelines which provide intermittent screening of the panels giving rise to glare. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that hedgerow planting is proposed in front of the proposed panels seen, which when established will provide substantial screening of the panels giving rise to glare. However, there will likely still be some partial visibility of the proposed panels. Therefore, the impact is reduced to **Low** in accordance with **Table 16.2.1**.

16.2.290 **Residential Receptor 4:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a large section of the northern part of W3 can potentially impact on the receptors represented by this receptor point.

16.2.291 There is substantial existing screening from hedgerows and treelines obstructing views of the proposed panels giving rise to glare. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that proposed hedgerow with trees planting is proposed in front of the proposed panels seen, which will further restrict visibility of the panels from this location. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.292 **Residential Receptor 5:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a large section of the northern part of W3 can potentially impact on the receptors represented by this receptor point.

16.2.293 There will be no visibility of the panels giving rise to glare from the receptors represented by this receptor point. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that proposed hedgerow with trees planting is proposed in front of the proposed panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.294 **Residential Receptor 6:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a large section of the northern part of W3 can potentially impact on the receptors represented by this receptor point.

16.2.295 There is substantial existing screening from topography, hedgerows and treelines obstructing views of the proposed panels giving rise to glare. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that proposed hedgerow with trees planting is proposed in front of the proposed panels seen, which will further restrict visibility of the panels from this location. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.296 **Residential Receptor 7:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that a small corner of the southeastern part of W3 can potentially impact on the receptors represented by this receptor point.

16.2.297 There are screening elements in the intervening space between the panels and the receptors that will entirely screen views of the panels giving rise to glare. These include hedgerows and other vegetation in the gardens of the receptors, as well as a cluster of trees closer to the panels, and finally a raised bank, which will obstruct views of the panels giving rise to glare from the receptors further from the panels. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.298 **Residential Receptors 8 and 24:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that two sections of the southern part of W3 can potentially impact on the receptors represented by these receptor points.

16.2.299 Views from along this row of receptors towards the panels giving rise to glare. For receptor point 8, there is a large treeline located adjacent to the receptors here which screen views in this direction. For receptors located closer to, and at receptor point 24, there are open views over the waterbody in the intervening space between the receptors and the panels giving rise to glare. However, on the far side of the waterbody a large dense patch of existing vegetation prevents further views in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.300 **Residential Receptor 25:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that the eastern section of the southern part of W3 can potentially impact on the receptors represented by these receptor points.

16.2.301 There is tall vegetation bordering the receptors at this location. There is a gap in this vegetation permitting views across the waterbody and the fields beyond where the solar panels are located. The large dense patch of vegetation on the far side of the waterbody provides screening here of some of the panels giving rise to glare. However further assessment has been undertaken.

16.2.302 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period less three months, and individual reflection events would last less than 60 minutes on any given day at this receptor.

16.2.303 Existing buildings are predicted to significantly obstruct visibility of the reflecting panels from viewpoints on the ground floor, while views from above this are considered possible. On this basis, the predicted impact is assessed as **Low** using the Pager Power methodology.

16.2.304 **Residential Receptors 9 and 10:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that two sections of the southern part of W3 can potentially impact on the receptors represented by these receptor points.

16.2.305 Views from receptor point 9 illustrate that there is open visibility towards the closer fields (i.e. the southeastern part of W3) where panels giving rise to glare are located. This is a result of the open views available from a relatively elevated location. From receptor point 10 there are similarly open views towards the fields where the panels giving rise to glare are located. However further assessment has been undertaken.

16.2.306 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the

development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.307 The Pager Power review did not identify any existing or potential screening features, suggesting that reflections may be visible where receptors have an unobstructed line of sight to the panels. While the potential effects are reduced by the fact that any reflections would predominantly coincide with periods of direct sunlight, making them less noticeable to receptors, the resulting effects are deemed significant. Overall, the predicted impact is assessed as **Moderate** using the Pager Power methodology.

16.2.308 **Residential Receptor 13:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that northern section of the southeastern part of W3 can potentially impact on the receptors represented by this receptor point.

16.2.309 The built environment located in the intervening space between this receptor point and the panels giving rise to glare will entirely screen the panels from view. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.310 **Residential Receptor 14:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that northern and southeastern parts of W3 can potentially impact on the receptors represented by this receptor point.

16.2.311 There is a large woodland located in between the proposed panels giving rise to glare and this receptor. There will be no visibility of the panels from this receptor. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.312 **Residential Receptors 15, 16 and 26:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that northern and southern parts of W3 can potentially impact on the receptors represented by these receptor points.

16.2.313 As is similarly the case with receptor 14, the strip of woodland located in the intervening space will also screen any potential views of the proposed panels giving rise to glare from these receptors. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.314 **Residential Receptor 19:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that southern parts of W3 can potentially impact on the receptors represented by this receptor point.

16.2.315 There are potential views from this receptor towards the panels giving rise to glare, although there is partial screening provided by the intervening hedgerow. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that proposed hedgerow planting is proposed in front of the proposed panels seen, which will further restrict visibility of the panels from this location. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.316 **Residential Receptor 21:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that southern parts of W3 can potentially impact on the receptors represented by this receptor point.

16.2.317 There is open visibility towards the closer fields (i.e. the southeastern part of W3) where panels giving rise to glare are located. This is a result of the open views available from a relatively elevated location. The Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management**

Plan [EN0110020/APP/5.13] provides that proposed hedgerow planting is proposed in front of the proposed panels seen, which will further restrict visibility of the panels from this location, although only partially given the relative topography. However further assessment has been undertaken

16.2.318 Further assessment from Pager Power (See **Annex B: Pager Power – Road and Residential Receptors**) indicates that solar reflections from the development are geometrically possible for a period exceeding three months, although individual reflection events would last less than 60 minutes on any given day at both of these receptors.

16.2.319 The Pager Power review did not identify any existing or potential screening features, indicating that reflections may be visible where receptors have a direct line of sight to the panels. However, potential effects are reduced because reflections would largely coincide with periods of direct sunlight and would originate from a distance of over 850 metres from the receptor, limiting their perceptibility. Taking these factors into account, the predicted impact is assessed as **Low** using the Pager Power methodology.

16.2.320 **Residential Receptor 22:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that southern parts (in opposite directions, i.e. to the east and west) of W3 can potentially impact on the receptors represented by this receptor point.

16.2.321 The receptors represented by this receptor point are surrounded to the east and west (i.e. the directions of the panels giving rise to glare) by large vegetation, including a large treeline to the west bordering the receptors and the motorway, and multiple treelines and hedgerows to the east. There will be no visibility of the panels giving rise to glare from these receptors. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.322 **Residential Receptor 23:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that southern parts (in opposite directions, i.e. to the east and west) of W3 can potentially impact on the receptors represented by this receptor point.

16.2.323 For views eastwards, the receptors represented by this receptor point are within a localised depression in elevation, relative to the fields to the east. The intervening topography can be seen to obstruct views of further fields in this direction, where the proposed panels giving rise to glare are located. For views westwards, the large treeline bordering the motorway can be seen to prevent any views in the direction of panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.324 **Residential Receptor 27:** The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis**, shows that northern part of W3 can potentially impact on the receptors represented by this receptor point.

16.2.325 Views towards the proposed panels from this receptor point are where the declining topography permits partial views of the proposed panels. The 'Glare Reflections on the PV Footprint' chart shown in **Annex A: Glare Analysis** indicate that it is the southeastern corner of northern part of the W3 which is giving rise to glare. This part is primarily located at the lowest point of the fields where the panels are located, and which are substantially screened form this receptor point by topography, and existing intervening vegetation in the form of hedgerows. Note that the Illustrative Mitigation Masterplan, presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that hedgerow planting has been proposed in the intervening space

here between the receptor and the panels, further restricting visibility. Therefore, the impact is reduced to **Low** in accordance with **Table 16.2.1**.

16.2.326 **Table 26.2.27** below summarises the results of the Detailed Assessment presented previously.

Table 26.2.27 Detailed Assessment Summary – Whitestone 3 Residential Receptors

Receptor	Assessment Magnitude
1	None
3	Low
4	Low
5	None
6	None
7	None
8	None
9	Moderate
10	Moderate
13	None
14	None
15	None
16	None
19	None
21	Low
22	None
23	None
24	None
25	Low
26	None
27	Low
28	None

Whitestone 1 – Road and Rail Receptors

16.2.327 **Route 1 – M18:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that W1 can potentially impact on most of the stretch of the M18 assessed within the Study Area, except for the southern stretch of the M18 where the road bends gently southwards.

16.2.328 An appraisal of views towards the proposed panels giving rise to glare has been completed using the available street view imagery for the stretch of the M18 shown as potentially experiencing glare.

16.2.329 For the majority of this stretch of the M18, there is substantial existing roadside screening present, and therefore no glare can occur. This is a result of high-banks that typically border motorways, as well as dense vegetation on the roadside, preventing views towards the Proposed Development.

16.2.330 There are a number of locations identified where there are views towards the proposed panels giving rise to glare, from the M18. These are along sections of road where less dense roadside screening, and elevated positioning relative to the panels giving rise to glare, allow views in this direction.

16.2.331 From the majority of the route, there will be no visibility of the panels, and from these sections the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.332 In relation to the locations where sufficient existing roadside screening is not present, Pager Power undertook further assessment focused on the areas identified as having the highest potential for impact (see **Annex B: Pager Power – Road and Residential Receptors**). This was split between 7 points (A1 – A7 as detailed in **Annex B: Pager Power – Road and Residential Receptors**.

16.2.333 For receptors A1–A2 and A5–A6, the assessment confirms that solar reflections are geometrically possible and fall within a road user's primary field of view (FOV). Existing vegetation is expected to partially screen the panels, resulting in only fleeting views through short gaps. While reflections remain within the primary FOV, they do not occur directly ahead of the driver. Additional mitigating factors include the coincidence of reflections with direct sunlight, viewing angles more than 35° from the direction of travel, and distances exceeding 550 m. Overall, using Pager Power's methodology, these receptors are assessed as experiencing a **Low** impact (see **Annex B: Pager Power – Road and Residential Receptors**).

16.2.334 For receptors A3–A4 and A7, solar reflections are likewise geometrically possible and occur within the primary FOV. Vegetation is predicted to obstruct views to a degree, although some residual visibility remains. As with the first group, reflections stay within the primary FOV but are not positioned directly in front (within 10 degrees either side of road users' direction of travel) of the receptor. Reflections primarily coincide with direct sunlight and originate at distances greater than 680 m, meaning the resulting effects are deemed significant. These factors result in a **Moderate** predicted impact classification using Pager Power's methodology (see **Annex B: Pager Power – Road and Residential Receptors).**

Table 16.28: Detailed Assessment Summary – Whitestone 1 Road Receptors

Receptor	Assessment Magnitude
Route 1 – M18	Moderate

Whitestone 2 – Road and Rail Receptors

16.2.335 **Route 2B – A618:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that W2B can potentially impact on the central section of the stretch of the A618 assessed within the Study Area.

16.2.336 Views over the fields where the proposed panels have potential to give rise to glare are available intermittently along the section of the route with glare impacts. The Illustrative Mitigation Masterplan presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** provides that the southernmost area of panels giving rise to glare will be bordered on the near side

by hedgerow planting, which will provide some screening of the panels giving rise to glare.

16.2.337 Pager Power undertook further assessment focused on the areas identified as having the highest potential for impact (see **Annex B: Pager Power – Road and Residential Receptors**). This was split between 13 points (B1 – B13 as detailed in **Annex B: Pager Power – Road and Residential Receptors)**.

16.2.338 For receptor location B3–B13, the assessment concludes that all are subject to a **Low** impact in line with Pager Power's methodology. This outcome is driven by either reflections falling outside a road user's primary field of view or existing vegetation significantly obstructing views of the reflecting panels. Additionally, for receptors B10 and B12 at an 8° tilt, reflections predominantly coincide with periods of direct sunlight, originate from angles exceeding 40° from the direction of travel, and occur at distances greater than 550 m from the receptor. As a result, these receptors are not expected to experience meaningful glare effects from solar reflections. Therefore, the impact is reduced to **Low** for this section.

16.2.339 For receptor locations B1–B2, solar reflections are geometrically possible and occur within the primary field of view. Although existing vegetation is predicted to provide partial screening, some residual visibility remains. Reflections continue to fall within the primary FOV when screening is considered, but not directly ahead of the driver. Reflections also coincide only partially with direct sunlight, the resulting effects are deemed significant. Taking these factors together, these receptors are assessed as experiencing a **Moderate** impact in line with Pager Power's methodology (**Annex B: Pager Power – Road and Residential Receptors)**.

16.2.340 **Route 4B – Midland Main Railway Line:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern part of W2B can potentially impact on a southern section of the stretch of the Midland Main Railway Line assessed within the Study Area. This stretch of the route is bordered by a large treeline to the east, as well as a large housing estate which will completely screen views of the proposed panels in this direction. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.341 **Route 1C – M1:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern parts of W2C can potentially impact on the northern sections of the two stretches of the M1 assessed within the Study Area, the main roadway and the slip road from the M18.

16.2.342 There is one small stretch of road, where the tall roadside bank dips, and where an open view of the field where proposed panels are located is available. This area will be visible for an approximately 350 m stretch of the motorway. Aside from this stretch, there will be no visibility of panels in the direction of panels where glare impacts arise. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.343 Views when travelling west along the road with the panels give rise to glare from W2C located directly in front (within 10 degrees either side of road users' direction of travel) of the vehicles. There will potentially be views of proposed panels through small gaps in the vegetation along this stretch of the road, however, the specific panels that are giving rise to glare are completely screened by dense existing vegetation seen in front, and at the side of this road. There will be no glare impacts on this stretch of road. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.344 **Route 6C – M18:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern and central parts of W2C can potentially impact on two stretches of the M18 assessed within the Study Area.

16.2.345 The first section of the road with glare impacts modelled is located to the north of the route, where it enters the Study Area, with glare arising from the northern part of W2C. There will be no visibility of the panels giving rise to glare from this stretch of road (looking to the west, travelling south along the road), given the level of vegetation present along the roadside.

16.2.346 The second stretch of the roadway with glare impacts modelled is located further south along the road, with the panels giving rise to glare located to the west. Similar to the northern section of this route, the roadside screening present will result in no visibility of the area of panels giving rise to glare.

16.2.347 Therefore, the impact on this receptor is reduced to **None** in accordance with **Table 16.2.1**.

16.2.348 **Route 1D – M1:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central parts of W2D can potentially impact on a central stretch of the M1 assessed within the Study Area.

16.2.349 Views from along this stretch of the route travelling north demonstrate there is substantial screening along the roadside from the southern part of this section. Even where this roadside screening falls away, the topography adjacent to the road screens views of the panels giving rise to glare. There is one location, at the northern end of the stretch of the road where glare is modelled, where panels giving rise to glare are visible across a number of fields. This visibility occurs for an approximately 100 m stretch of the roadway before the roadside screening increases and the panels are once again screened from view.

16.2.350 The Illustrative Mitigation Masterplan presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that screening has been proposed in the intervening space here between the receptor and the solar PV modules further restricting visibility. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.351 **Route 2D – M18:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a northwestern corner of W2D can potentially impact on a small central stretch of the M18 assessed within the Study Area.

16.2.352 Pager Power undertook further assessment focused on the areas identified as having the highest potential of impact (see **Annex B: Pager Power – Road and Residential Receptors**). This was split between 7 points (E1 – E7).

16.2.353 For all receptor locations, the assessment concludes that all are subject to a **Low** impact in line with Pager Power's methodology (**Annex B: Pager Power – Road and Residential Receptors).** This outcome is driven by either reflections falling outside a road user's primary field of view or existing vegetation significantly obstructing views of the reflecting panels. As a result, these receptors are not expected to experience meaningful glare effects from solar reflections.

16.2.354 **Route 4D – A57:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that a southeastern corner of W2D can potentially impact on the western stretch of the A57 assessed within the Study Area.

16.2.355 There are a number of views from this receptor, travelling from west to east, along the stretch of road modelled as receiving glare, where there is intermittent roadside screening present along the road which will screen views from the western end, but the screening effect reduces as an observer travels east along the road. Where the roadside screening falls away, the local topography of the fields located adjacent to the road prevent visibility of the southeastern area of W2D which is giving rise to glare. There are panels visible from these locations, but they are located further west than the panels modelled as giving rise to glare are located. This topographical screening effect continues until a nearby cluster of trees begins to screen views in this direction again. Therefore, there will be no visibility of the panels giving rise to glare from this route, and the impact is reduced to **None** in accordance with **Table 16.2.1**.

16.2.356 **Route 1E – A57:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the northern, central, and southern parts of W2E can potentially impact on three separate stretches of the A57 assessed within the Study Area.

16.2.357 Views from the western end of the stretch where glare is first modelled, travelling east to the end of the stretch of road assessed within the Study Area, demonstrate that the initial stretch of the western end of the parts of the road with glare arising will have views towards the panels substantially screened, given the distance and intervening topography and other screening elements in the landscape. There will generally be open visibility of the southern part of the W2E which is giving rise to glare. This visibility continues for the majority of the remainder of the route. For the stretch of road where open visibility towards the panels occurs, it is noted that there are some small sections which are not modelled as receiving glare, however the majority is, as seen in **Annex A: Glare Analysis**. Therefore, further assessment was undertaken.

16.2.358 Pager Power undertook further assessment focused on the areas of this route identified as having the highest potential for impact. This was split between 19 points (C1 – C19 as detailed in **Annex B: Pager Power – Road and Residential Receptors)**.

16.2.359 The analysis confirms that solar reflections are geometrically possible at these receptors and occur within a road user's primary FOV. No existing screening is identified, meaning reflections remain fully visible. When considering the absence of screening, the reflections not only remain within the primary FOV but occur directly in front of the driver (within 10 degrees either side of road users' direction of travel). Although reflections partially coincide with direct sunlight, this does not fully mitigate the effect. On this basis, using Pager Power's methodology the receptor is assessed as experiencing a **Moderate** impact, see **Annex B: Pager Power – Road and Residential Receptors)**

16.2.360 **Route 3E – South Yorkshire Joint Railway Line:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that the central and southern parts of W2E can potentially impact on the southern half of the route assessed within the Study Area.

16.2.361 There is intermittent screening present along the northern and central parts of the route where glare is occurring. Further to the south, the level of screening bordering the route increases and it is unlikely that there will be any visibility of the proposed panels from this part of the route. There are also some treelines and hedgerows visible further west than the route itself, which will provide some screening of panels giving rise to glare. The possibility of views of panels giving rise to glare cannot be excluded on the basis of this review of aerial imagery.

16.2.362 However, embedded mitigation shown on the Illustrative Mitigation Masterplan, and presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]** indicates that screening has been proposed in the intervening space here between the receptor and the solar PV modules in the form of existing hedgerow enhancement, restricting actual visibility. Therefore, the impact is reduced to **None**.

Table 16.29: Detailed Assessment Summary – Whitestone 3 Road Receptors

Receptor	Assessment Magnitude
Route 2B – A618	Moderate
Route 4B – Midland Main Railway Line	None
Route 1C – M1	None
Route 6C – M18	None
Route 1D – M1	None
Route 2D – M18	Low
Route 4D – A57	None
Route 1E – A57	Moderate
Route 3E – South Yorkshire Joint Railway Line	None

Whitestone 3 – Road and Rail Receptors

16.2.363 **Route 1 – A618:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that W3 can potentially impact on two sections of the A618. Firstly, a small stretch to the north of the section the route assessed, where the road enters the outskirts of the settlement of Killamarsh. At this location, the built environment surrounding the road will prevent views towards the proposed panels and no visibility of the panels giving rise to glare will occur.

16.2.364 The second stretch of the A618 potentially impacted is located to the south, where the route begins to border the southern extent of the proposed panels of W3. There are a series of views towards the proposed panels from this point, travelling southeast along the road. There are also open views from this location, towards the proposed panels located in the southwestern end of W3, which are indicated as giving rise to glare on this stretch of road. Views demonstrate that these panels become screened by roadside vegetation. Further southeast along the road, this level of screening continues to prevent views towards the area of panels giving rise to glare on this stretch of the road (i.e. now glare is focused from panels in the southeastern end of W3).

16.2.365 The only section of road where there is visibility of panels giving rise to glare is an approximately 340 m stretch of road running northwest of White Rose Way.

16.2.366 However, embedded mitigation shown in the Illustrative Mitigation Masterplan, and presented in the **outline Landscape and Ecology Management Plan**

[EN0110020/APP/5.13] indicates that screening has been proposed in the intervening space here between the receptor and the solar PV modules restricting actual visibility in the areas where the was visibility of panels giving rise to glare. Therefore, the impact is reduced to **None** in accordance with **Table 16.2.30**.

16.2.367 **Route 2 – M1:** The 'Glare Reflections on the PV Footprint' charts shown in **Annex A: Glare Analysis**, shows that W3 can potentially impact on two separate sections of the M1 assessed within the Study Area.

16.2.368 The first stretch is to the north of the route, where the motorway runs adjacent to the northern part of W3. There are a series of views from this location to the east, in the direction of the panels giving rise to glare, which demonstrate there is intermittent visibility that occurs from this stretch, as a result of the intermittent roadside vegetation. It is noted that the parts of the fields in view from this stretch tend to be those further from the edge that borders the road, as a result of the steep drop in elevation from the roadside. The glare is modelled as occurring from the outer edges of the panel area here, partially that which is located in this area which is not easily visible given the drop in elevation. However, from a precautionary perspective, it is concluded that there are potentially views of panels giving rise to glare from this stretch of the motorway.

16.2.369 Pager Power undertook further assessment focused on the areas identified as having the highest potential for impact. This was split between 5 points (D1 – D5 as detailed in **Annex B: Pager Power – Road and Residential Receptors)**.

16.2.370 For receptors D1 and D5, and D2-4 in a 25º tilt scenario, the Pager Power assessment confirms that solar reflections are to occur outside a road user's primary FOV. Existing vegetation is also expected to partially screen the panels. Therefore, using Pager Power's methodology, these receptors are assessed as experiencing a **Low** impact, see **Annex B: Pager Power – Road and Residential Receptors**.

16.2.371 For receptors D2 - D4 at an 8º tilt, solar reflections are geometrically possible and occur within the primary FOV. Vegetation is predicted to obstruct views to a degree, although some residual visibility remains. Reflections also partially coincide with direct sunlight which acts as a partial mitigation factor, however the resulting effects are still deemed significant. As a result, these factors result in a **Moderate** predicted impact classification using Pager Power's methodology.

16.2.372 The second stretch of the M1 modelled as being potentially impacted by glare is located further south along the route, where the road runs adjacent to the southern part of W3, with panels to the east modelled as giving rise to glare. Views from this stretch of the road have substantial roadside screening present, which prevent views towards the proposed panels. There will be no visibility of the panels giving rise to glare from this stretch of motorway, and the impact here is reduced to **None** in accordance with **Table 16.2.30**.

Table 16.2.30: Detailed Assessment Summary – Whitestone 3 Road Receptors

Receptor	Assessment Magnitude
Route 1 – A618	None
Route 2 – M1	Moderate

Aviation receptors

16.2.373 Solar reflections with the potential to cause a temporary after-image were predicted towards the visual circuits at Netherthorpe Airfield when panels without Anti-Reflective Coating (ARC) were initially assessed. The Pager Power assessment **(see Annex C Pager Power – Aviation Receptors.)** identified instances of yellow glare intensity affecting Runways 06 and 24 at both 8-degree and 25-degree panel tilts, with additional yellow glare predicted for Runways 18 and 36 when modelled at a 25-degree tilt. At the lower 8-degree tilt, Runways 18 and 36 were instead associated with green glare intensity, which is considered acceptable under relevant guidance and industry best practice for safeguarding at licensed aerodromes.

16.2.374 However, following this initial assessment, the Proposed Development incorporated ARC on solar panels into the Project Description. Therefore, subsequent Pager Power assessment incorporating ARC, concluded that only green glare would occur towards the runways, with reflections towards the visual circuits reduced to a “low-potential temporary after-image” level. In line with relevant guidance and industry best practice for safeguarding 2-mile approach paths at licensed aerodromes, this lower-intensity glare is considered acceptable, and therefore the predicted reflections are also deemed acceptable for the visual circuits at Netherthorpe Airfield. Therefore, the impact on this receptor can be classified as **None**. Full details are provided in **Annex C: Pager Power – Aviation Receptors.**

16.2.375 For Doncaster airport, both Runways 02 and 20 presented no green, yellow or red glare occurring from any of the solar panels. Therefore, the impact on this receptor can be classified as **None**.

Additional Mitigation

16.2.376 Prior to construction, when detailed design and equipment selection has been confirmed, further glint and glare modelling will be undertaken to confirm if and where additional mitigation is needed.

16.2.377 Based on the detailed assessment above, a very small number of road receptors were identified as having moderate impacts. Therefore, additional areas of screening and landscaping have been added to the Proposed Development as shown in the Illustrative Mitigation Masterplan and presented in the **Outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**, which provide screening of glint and glare on these receptors. Further analysis of glint and glare will be undertaken as part of detailed design. Should detailed design still identify these roads as requiring mitigation, then this additional screening and planting will be implemented to mitigate impacts.

16.2.378 For residential receptors, where the detailed assessment presents a moderate impact, all of which are over 300m away from solar panels with potential to cause glare, the Applicant is committed through detailed design and post consent consultation with relevant receptors, to explore mitigation solutions, which may be offsite.

Stage 3 - Residual Impact Assessment

Road and Rail Receptors

16.2.379 Following further assessment by Pager Power and the incorporation of proposed additional mitigation measures, no significant residual glare effects are predicted for road or rail receptors, with all assessed residual impacts reduced to **None**.

16.2.380 **Whitestone 1 Route 1** - As part of the Pager Power analysis, locations for additional planting were identified, and opaque fencing has been proposed as an interim measure while the vegetation establishes. This would be predicted to obstruct views of the proposed panels from this stretch of the M18 which are include in the Illustrative Mitigation Masterplan, and presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**. Therefore, the residual impact on the M18 is reduced to **None**.

16.2.381 **Whitestone 2 Route 2B** - As part of the Pager Power Analysis, locations for additional planting were identified, and opaque fencing has been proposed as an interim measure while the vegetation establishes. This would be predicted to obstruct views of the proposed panels from this stretch of the A618 which are include in the Illustrative Mitigation Masterplan, and presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**. Therefore, the residual impact on the A618 is reduced to **None**.

16.2.382 **Whitestone 2 Route 1E** - As part of the Pager Power Analysis, locations for additional planting were identified, and opaque fencing has been proposed as an interim measure while the vegetation establishes. This would be predicted to obstruct views of the proposed panels from this stretch of the A57 which are include in the Illustrative Mitigation Masterplan, and presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**. Therefore, the residual impact on the A57 is reduced to **None**.

16.2.383 **Whitestone 3 Route 2** - As part of the Pager Power Analysis, additional planting were identified, and opaque fencing has been proposed as an interim measure while the vegetation establishes. This would be predicted to obstruct views of the proposed panels from this stretch of the M18 which are include in the Illustrative Mitigation Masterplan and presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**. Therefore, the residual impact on the M18 is reduced to **None**.

Residential Receptors

16.2.384 Following the Stage 2 detailed assessment, nine Moderate level impacts were identified for residential receptors.

16.2.385 These Moderate glare impacts were predicted to occur for the following receptors:

- Whitestone 1 Residential Receptor 37 (498m distance from solar panels with potential to cause glare) – As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between the hours of 17:00 to 19:15 between the months of March to October. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see Annex B for further details).

- Whitestone 2 Residential Receptor 7 (332m distance from solar panels with potential to cause glare) - As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between the hours of 4:45 to 6:30 between the months of March to October. It is noted as a mitigating factor that reflections woueld occur only during times of direct sunlight (see Annex B for further details).
- Whitestone 2 Residential Receptor 8 (282m distance from solar panels with potential to cause glare) – As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between the hours of 4:45 to 6:30 between the months of March to October. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see Annex B for further details).
- Whitestone 2 Residential Receptor 19 (463m distance from solar panels with potential to cause glare) - As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between 4:45 to 5:30 in the morning and 18:00 to 19:00 in the evening from April to June and July to September. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see Annex B for further details).
- Whitestone 2 Residential Receptor 78 (333m distance from solar panels with potential to cause glare) - As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between 5:00 to 6:00 in the morning and 19:00 to 19:30 in the evening from April to June and late-July to October. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see Annex B for further details).
- Whitestone 2 Residential Receptor 92 (404m distance from solar panels with potential to cause glare) - As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between the hours of 18:00 to 19:30 between the months of March to October. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see Annex B for further details).
- Whitestone 2 Residential Receptor 93 (484m distance from solar panels with potential to cause glare) - As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between the hours of 18:00 to 19:30 between the months of March to October. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see Annex B for further details).
- Whitestone 3 Residential Receptor 9 (501m distance from solar panels with potential to cause glare) - As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between the hours of 18:00 to 19:30 between the months of March to October. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see Annex B for further details).

- Whitestone 3 Residential Receptor 10 (478m distance from solar panels with potential to cause glare) - As set out above in the Stage 2 assessment, a moderate level impact is identified for this receptor as a result of the glare occurring during part of the period between the hours of 18:00 to 19:30 between the months of March to October. It is noted as a mitigating factor that reflections would occur only during times of direct sunlight (see **Annex B** for further details).

16.2.386 Additional areas of screening and landscaping have been added to the Illustrative Mitigation Masterplan and presented in the **outline Landscape and Ecology Management Plan [EN0110020/APP/5.13]**, which provide partial screening of glint and glare on these receptors. Note that these results follow a worst-case assessment methodology and assume that the sun is always shining at its fullest intensity. Therefore, the impacts do not account for different weather conditions that frequently occur that would in reality give rise to lower effects and durations than the worst-case assessment presented.

Cumulative Effects

16.2.387 Inter project effects arise where other existing or approved developments lie close enough to the Proposed Development to create a combined effect on shared receptors, even if individual impacts are not Significant. Cumulative effects are possible when other solar farms are located within the 1km Study Area of ground-based receptors including road user receptors. From the list of cumulative developments presented in **ES Volume 3, Appendix 17.2: Long List of Developments for Cumulative Effects Assessment [EN0110020/APP/6.20]**, there are three solar projects within 1 km of the Proposed Development (specifically W2) that have been assessed for cumulative effects: Thurcroft Interchange Energy Park (Land off Morthen Lane, Morthen), Piper Lane (Land off Carr Lane, Ulley) and Common Farm (Bookers Lane, Dinnington).

16.2.388 In relation to Thurcroft, its assessment identified two residential receptors with residual glare after mitigation. One of these corresponds to a receptor also in the Proposed Development assessment; however, no glare was predicted from Whitestone at this location, so no cumulative interaction is expected. The second Thurcroft receptor lies far enough north of W2 that it is outside the area of potential glare from the Proposed Development.

16.2.389 Piper Lane lies south of W2 and shares several potential receptors with the Proposed Development. Only two (Whitestone 2 Residential Receptors 49 and 50 in this report) are identified in both assessments as potentially experiencing glare. For Receptor 49, both studies predict a low magnitude of glare, with cumulative glare durations remaining below 60 minutes on any given day. Furthermore, substantial pre-existing screening and the distance from the solar panels further limits visibility of the Proposed Development panels and the cumulative panels. Similarly, Receptor 50 also receives a low glare impact from both assessments. High levels of existing vegetation would intercept and diffuse the majority of any theoretical glare originating from either Piper Lane or the Proposed Development for these receptors.

16.2.390 Common Farm is located to the southeast of W2 and shares a number of receptors with the Proposed Development. Among these, approximately 300 m of Todwick Road was identified as experiencing glare impact requiring additional mitigation from the Common Farm scheme, for which screening mitigation has

been proposed. This same section of Todwick Road was also identified as experiencing yellow glare within the bare earth analysis for the Proposed Development. However, subsequent detailed assessment of the Proposed Development, including consideration of existing screening in the landscape, indicates that high levels of established vegetation would intercept any potential glare at this location. As such, when considered alongside the proposed mitigation for Common Farm, significant cumulative impacts on this receptor are considered unlikely. No other receptors within the Common Farm assessment were identified as requiring mitigation, and so no cumulative interaction between that development and the Proposed Development is expected.

16.2.391 Overall, none of the receptors assessed are predicted to experience cumulative glint and glare effects.

Conclusions

16.2.392 Following consideration of embedded mitigation measures, there are no glint and glare effects on aviation assets (i.e. Doncaster or Netherthorpe).

16.2.393 Following consideration of existing screening and embedded mitigation measures, there are no glint and glare effects on PRoWs.

16.2.394 Following consideration of embedded and additional mitigation measures, there are no glint and glare effects on road and rail receptors.

16.2.395 Following consideration of embedded and additional mitigation measures, there are nine moderate level glare impacts on residential receptors if worst case assumptions are used.

References

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[11] Rogers, J. A., et al. (2015). "Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach", Federal Aviation Administration

[12] Holding Note: It is noted that Doncaster Sheffield Airport has received funding at the time of writing, to reopen from 2027. [redacted] (date accessed: 10/09/2025). Given the timing of the announcement of the reopening of this airport, it has not been included in the assessment of this ES Appendix. Further assessment of the aviation assets associated with this airport will be undertaken for the ES.

Annex A – Glare Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 1**
Site configuration: **JS - W1 RR and Transport-temp-1**

Created 27 Jun, 2025
Updated 27 Jun, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 500 kW to 1 MW
Site ID 153253.25566

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	28,565	476.1	17,713	295.2	-
PV array 2	8.0	180.0	224,790	3,746.5	102,118	1,702.0	-
PV array 3	8.0	180.0	12,362	206.0	10,111	168.5	-
PV array 4	8.0	180.0	9,822	163.7	7,261	121.0	-
PV array 5	8.0	180.0	7,705	128.4	18,830	313.8	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

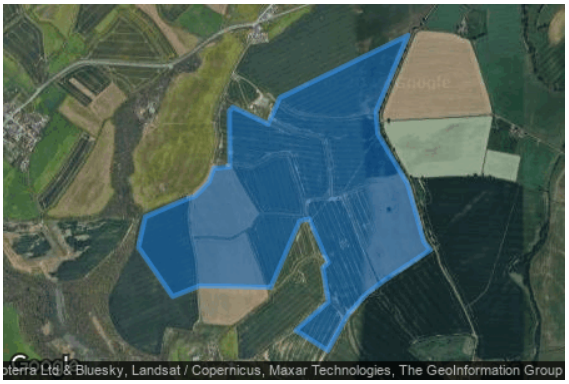
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	2,712	45.2	3,370	56.2
B6093	0	0.0	0	0.0
B6094 and Ruddle Lane	9,230	153.8	17,679	294.6
M18	8,917	148.6	11,091	184.8
OP 1	869	14.5	1,747	29.1
OP 2	1,291	21.5	2,287	38.1
OP 3	1,794	29.9	2,490	41.5
OP 4	1,173	19.6	356	5.9
OP 5	456	7.6	0	0.0
OP 6	2,381	39.7	2,755	45.9
OP 7	2,623	43.7	2,570	42.8

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 8	2,470	41.2	2,101	35.0
OP 9	1,846	30.8	2,513	41.9
OP 10	2,961	49.4	750	12.5
OP 11	710	11.8	88	1.5
OP 12	688	11.5	43	0.7
OP 13	208	3.5	0	0.0
OP 14	187	3.1	0	0.0
OP 15	148	2.5	0	0.0
OP 16	108	1.8	0	0.0
OP 17	1,166	19.4	913	15.2
OP 18	149	2.5	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	2,420	40.3	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	314	5.2	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	4,172	69.5	7,689	128.2
OP 30	6,595	109.9	9,490	158.2
OP 31	6,511	108.5	8,343	139.1
OP 32	3,318	55.3	4,856	80.9
OP 33	201,258	3,354.3	53,865	897.8
OP 34	0	0.0	0	0.0
OP 35	1,948	32.5	0	0.0
OP 36	1,966	32.8	2,423	40.4
OP 37	6,835	113.9	9,105	151.8
OP 38	5,820	97.0	9,509	158.5

Component Data

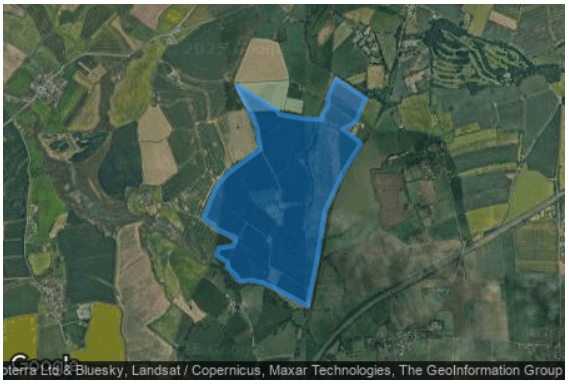
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.462880	-1.242763	80.60	3.80	84.40
2	53.461615	-1.245982	76.30	3.80	80.10
3	53.461117	-1.247097	70.70	3.80	74.50
4	53.460248	-1.248428	70.10	3.80	73.90
5	53.458766	-1.249812	78.70	3.80	82.50
6	53.459596	-1.252011	72.20	3.80	76.00
7	53.460759	-1.249780	66.60	3.80	70.40
8	53.462151	-1.250155	67.40	3.80	71.20
9	53.462362	-1.249769	66.30	3.80	70.10
10	53.462650	-1.250026	65.00	3.80	68.80
11	53.464150	-1.251099	66.70	3.80	70.50
12	53.464047	-1.251754	66.20	3.80	70.00
13	53.461346	-1.253738	60.60	3.80	64.40
14	53.461416	-1.258599	63.50	3.80	67.30
15	53.460975	-1.260476	67.20	3.80	71.00
16	53.462983	-1.262831	82.20	3.80	86.00
17	53.464219	-1.262370	83.30	3.80	87.10
18	53.464950	-1.259516	81.10	3.80	84.90
19	53.465077	-1.258915	80.50	3.80	84.30
20	53.465639	-1.257976	79.10	3.80	82.90
21	53.466204	-1.257649	78.40	3.80	82.20
22	53.466262	-1.256555	76.60	3.80	80.40
23	53.468550	-1.256575	78.50	3.80	82.30
24	53.468697	-1.256344	78.50	3.80	82.30
25	53.468007	-1.253919	78.10	3.80	81.90
26	53.469079	-1.253110	78.90	3.80	82.70
27	53.471629	-1.244293	77.00	3.80	80.80
28	53.468512	-1.246508	83.60	3.80	87.40
29	53.467605	-1.246379	82.70	3.80	86.50
30	53.465556	-1.244326	78.30	3.80	82.10
31	53.463205	-1.243211	79.60	3.80	83.40

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451858	-1.242251	76.10	3.80	79.90
2	53.452101	-1.243817	77.00	3.80	80.80
3	53.451968	-1.245330	76.40	3.80	80.20
4	53.452365	-1.245780	77.10	3.80	80.90
5	53.453157	-1.247089	73.80	3.80	77.60
6	53.453508	-1.247014	77.60	3.80	81.40
7	53.454133	-1.248632	80.80	3.80	84.60
8	53.454727	-1.248246	84.60	3.80	88.40
9	53.454880	-1.246271	89.30	3.80	93.10
10	53.455544	-1.245960	90.30	3.80	94.10
11	53.456142	-1.248170	86.90	3.80	90.70
12	53.456356	-1.248750	84.00	3.80	87.80
13	53.456595	-1.248900	83.60	3.80	87.40
14	53.457132	-1.250386	76.70	3.80	80.50
15	53.459695	-1.248626	72.60	3.80	76.40
16	53.460821	-1.247009	71.40	3.80	75.20
17	53.462776	-1.242546	80.50	3.80	84.30
18	53.464717	-1.243104	76.10	3.80	79.90
19	53.465886	-1.244037	77.30	3.80	81.10
20	53.467981	-1.245797	82.50	3.80	86.30
21	53.465982	-1.240304	65.80	3.80	69.60
22	53.465631	-1.239928	65.40	3.80	69.20
23	53.465299	-1.236903	62.50	3.80	66.30
24	53.465190	-1.234070	62.90	3.80	66.70
25	53.465573	-1.234006	62.10	3.80	65.90
26	53.466250	-1.233276	60.40	3.80	64.20
27	53.467151	-1.233244	57.90	3.80	61.70
28	53.468498	-1.232139	55.90	3.80	59.70
29	53.466900	-1.228049	68.80	3.80	72.60
30	53.464957	-1.229472	73.50	3.80	77.30
31	53.464421	-1.231172	72.30	3.80	76.10
32	53.464012	-1.230260	76.50	3.80	80.30
33	53.463498	-1.229219	81.20	3.80	85.00
34	53.463171	-1.228764	83.80	3.80	87.60
35	53.461159	-1.230909	82.30	3.80	86.10
36	53.457824	-1.233656	80.90	3.80	84.70
37	53.454042	-1.234665	90.90	3.80	94.70
38	53.449966	-1.236038	96.00	3.80	99.80
39	53.451282	-1.240093	81.60	3.80	85.40
40	53.451947	-1.242432	76.70	3.80	80.50

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465402	-1.224873	79.20	3.80	83.00
2	53.464182	-1.223639	86.50	3.80	90.30
3	53.463831	-1.223800	88.00	3.80	91.80
4	53.463365	-1.223832	90.80	3.80	94.60
5	53.462553	-1.223071	99.60	3.80	103.40
6	53.462336	-1.225077	95.10	3.80	98.90
7	53.461883	-1.225410	97.70	3.80	101.50
8	53.463959	-1.226901	83.10	3.80	86.90
9	53.465198	-1.225764	78.40	3.80	82.20

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461091	-1.227555	95.90	3.80	99.70
2	53.461116	-1.230044	85.70	3.80	89.50
3	53.459289	-1.231418	86.80	3.80	90.60
4	53.458484	-1.232072	86.60	3.80	90.40
5	53.457366	-1.232458	86.30	3.80	90.10
6	53.455504	-1.233220	87.80	3.80	91.60
7	53.455881	-1.231289	90.00	3.80	93.80
8	53.457031	-1.228800	97.30	3.80	101.10
9	53.456833	-1.228542	98.40	3.80	102.20
10	53.455625	-1.231064	90.90	3.80	94.70
11	53.455248	-1.233231	88.10	3.80	91.90
12	53.454096	-1.233596	89.80	3.80	93.60
13	53.454409	-1.232330	90.00	3.80	93.80
14	53.454301	-1.230538	93.40	3.80	97.20
15	53.455464	-1.228188	98.40	3.80	102.20
16	53.456651	-1.226227	103.50	3.80	107.30
17	53.457615	-1.226302	104.50	3.80	108.30
18	53.457890	-1.226034	105.80	3.80	109.60
19	53.458637	-1.226806	103.70	3.80	107.50
20	53.460013	-1.227390	98.70	3.80	102.50

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454007	-1.222055	116.70	3.80	120.50
2	53.454582	-1.215318	126.90	3.80	130.70
3	53.455030	-1.214824	128.20	3.80	132.00
4	53.455413	-1.215167	129.90	3.80	133.70
5	53.456205	-1.215210	132.10	3.80	135.90
6	53.457304	-1.215682	132.20	3.80	136.00
7	53.458390	-1.208451	120.40	3.80	124.20
8	53.459476	-1.208065	122.00	3.80	125.80
9	53.458454	-1.215897	130.70	3.80	134.50
10	53.457432	-1.215597	131.70	3.80	135.50
11	53.456243	-1.219824	133.90	3.80	137.70
12	53.455196	-1.219266	129.10	3.80	132.90
13	53.454595	-1.221562	118.00	3.80	121.80

Route Receptors

Name: Arbour lane
Path type: Two-way
Observer view angle: 50.0°



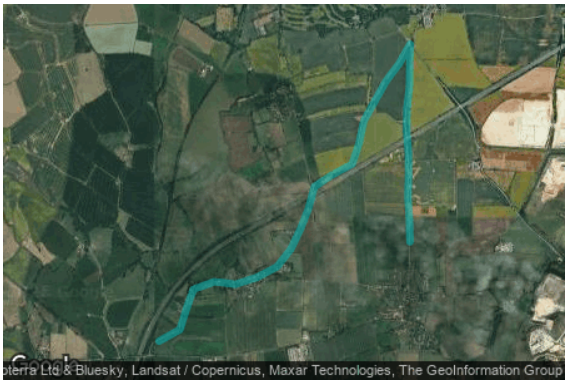
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.456997	-1.257824	53.70	1.50	55.20
2	53.456608	-1.260774	59.80	1.50	61.30
3	53.456039	-1.262062	66.70	1.50	68.20
4	53.455164	-1.262287	70.40	1.50	71.90
5	53.453337	-1.262276	78.10	1.50	79.60
6	53.451522	-1.262544	84.30	1.50	85.80
7	53.449963	-1.262019	91.90	1.50	93.40

Name: B6093
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465900	-1.277251	25.00	1.50	26.50
2	53.464309	-1.275760	43.90	1.50	45.40
3	53.462703	-1.274419	48.20	1.50	49.70
4	53.460774	-1.274226	61.80	1.50	63.30
5	53.458979	-1.274312	69.20	1.50	70.70
6	53.457196	-1.274516	80.60	1.50	82.10

Name: B6094 and Ruddle Lane
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.450516	-1.201218	110.40	1.50	111.90
2	53.452339	-1.201293	109.30	1.50	110.80
3	53.454108	-1.201507	108.80	1.50	110.30
4	53.455916	-1.201411	108.70	1.50	110.20
5	53.457762	-1.201432	107.90	1.50	109.40
6	53.459532	-1.201690	110.10	1.50	111.60
7	53.461378	-1.201636	108.00	1.50	109.50
8	53.463173	-1.201293	106.20	1.50	107.70
9	53.464949	-1.201239	107.00	1.50	108.50
10	53.466635	-1.201196	105.70	1.50	107.20
11	53.465038	-1.202720	108.00	1.50	109.50
12	53.463620	-1.204511	113.20	1.50	114.70
13	53.461995	-1.206048	116.20	1.50	117.70
14	53.460392	-1.207561	120.40	1.50	121.90
15	53.458629	-1.208183	120.80	1.50	122.30
16	53.456853	-1.209170	121.00	1.50	122.50
17	53.455971	-1.211938	126.80	1.50	128.30
18	53.455007	-1.214363	127.50	1.50	129.00
19	53.453213	-1.215180	125.80	1.50	127.30
20	53.451578	-1.216263	124.30	1.50	125.80
21	53.449923	-1.217583	126.30	1.50	127.80
22	53.448472	-1.219503	128.10	1.50	129.60
23	53.447615	-1.222261	133.30	1.50	134.80
24	53.447059	-1.225179	133.90	1.50	135.40
25	53.447263	-1.228140	126.60	1.50	128.10
26	53.446637	-1.230994	124.20	1.50	125.70
27	53.445161	-1.231878	121.20	1.50	122.70
28	53.443356	-1.232844	117.30	1.50	118.80
29	53.442416	-1.235698	117.90	1.50	119.40

Name: M18
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461569	-1.193905	98.70	1.50	100.20
2	53.460610	-1.196479	100.20	1.50	101.70
3	53.459684	-1.199097	103.10	1.50	104.60
4	53.458739	-1.201737	110.10	1.50	111.60
5	53.457768	-1.204333	112.50	1.50	114.00
6	53.456886	-1.206951	116.00	1.50	117.50
7	53.456026	-1.209472	120.40	1.50	121.90
8	53.455202	-1.212133	125.10	1.50	126.60
9	53.454282	-1.214826	126.40	1.50	127.90
10	53.453400	-1.217401	125.10	1.50	126.60
11	53.452442	-1.219954	123.40	1.50	124.90
12	53.451611	-1.222669	114.30	1.50	115.80
13	53.450800	-1.225340	109.60	1.50	111.10
14	53.449805	-1.227906	107.00	1.50	108.50
15	53.448616	-1.230320	107.80	1.50	109.30
16	53.447325	-1.232507	111.80	1.50	113.30
17	53.445920	-1.234342	110.50	1.50	112.00
18	53.444336	-1.236048	108.30	1.50	109.80
19	53.442720	-1.237453	115.80	1.50	117.30
20	53.440988	-1.238398	114.60	1.50	116.10

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.447346	-1.225228	130.30	2.00
OP 2	2	53.447696	-1.222640	131.60	2.00
OP 3	3	53.448207	-1.220767	129.40	1.00
OP 4	4	53.447102	-1.228042	128.70	2.00
OP 5	5	53.447096	-1.230963	120.00	2.00
OP 6	6	53.450085	-1.245769	81.10	2.00
OP 7	7	53.457352	-1.256496	57.40	2.00
OP 8	8	53.458441	-1.257671	62.60	2.00
OP 9	9	53.458968	-1.257510	60.40	2.00
OP 10	10	53.457233	-1.273775	80.60	2.00
OP 11	11	53.464212	-1.273918	36.60	2.00
OP 12	12	53.463331	-1.279609	37.20	2.00
OP 13	13	53.466445	-1.273504	27.90	2.00
OP 14	14	53.466959	-1.272898	34.40	2.00
OP 15	15	53.467557	-1.271718	41.70	2.00
OP 16	16	53.467943	-1.271316	43.60	2.00
OP 17	17	53.468714	-1.254014	78.60	2.00
OP 18	18	53.470084	-1.255923	79.70	2.00
OP 19	19	53.471932	-1.254933	81.60	2.00
OP 20	20	53.472681	-1.253425	81.80	2.00
OP 21	21	53.471893	-1.240549	67.30	2.00
OP 22	22	53.467672	-1.236220	60.10	2.00
OP 23	23	53.472336	-1.229046	51.50	2.00
OP 24	24	53.471731	-1.228818	53.10	2.00
OP 25	25	53.470999	-1.226730	57.50	2.00
OP 26	26	53.468990	-1.219413	79.70	2.00
OP 27	27	53.470868	-1.219660	76.10	2.00
OP 28	28	53.471372	-1.220378	71.80	2.00
OP 29	29	53.463332	-1.219528	104.20	2.00
OP 30	30	53.461823	-1.220090	122.40	2.00
OP 31	31	53.460761	-1.219003	129.30	2.00
OP 32	32	53.451241	-1.217211	126.40	2.00
OP 33	33	53.457404	-1.239851	86.40	2.00
OP 34	34	53.442150	-1.241126	113.50	2.00
OP 35	35	53.467953	-1.207806	114.30	2.00
OP 36	36	53.448072	-1.218610	129.00	2.00
OP 37	37	53.461153	-1.219963	128.20	2.00
OP 38	38	53.462146	-1.220344	117.00	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	28,565	476.1	17,713	295.2	-
PV array 2	8.0	180.0	224,790	3,746.5	102,118	1,702.0	-
PV array 3	8.0	180.0	12,362	206.0	10,111	168.5	-
PV array 4	8.0	180.0	9,822	163.7	7,261	121.0	-
PV array 5	8.0	180.0	7,705	128.4	18,830	313.8	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	2,712	45.2	3,370	56.2
B6093	0	0.0	0	0.0
B6094 and Ruddle Lane	9,230	153.8	17,679	294.6
M18	8,917	148.6	11,091	184.8
OP 1	869	14.5	1,747	29.1
OP 2	1,291	21.5	2,287	38.1
OP 3	1,794	29.9	2,490	41.5
OP 4	1,173	19.6	356	5.9
OP 5	456	7.6	0	0.0
OP 6	2,381	39.7	2,755	45.9
OP 7	2,623	43.7	2,570	42.8
OP 8	2,470	41.2	2,101	35.0
OP 9	1,846	30.8	2,513	41.9
OP 10	2,961	49.4	750	12.5
OP 11	710	11.8	88	1.5
OP 12	688	11.5	43	0.7
OP 13	208	3.5	0	0.0
OP 14	187	3.1	0	0.0
OP 15	148	2.5	0	0.0
OP 16	108	1.8	0	0.0
OP 17	1,166	19.4	913	15.2
OP 18	149	2.5	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	2,420	40.3	0	0.0
OP 23	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	314	5.2	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	4,172	69.5	7,689	128.2
OP 30	6,595	109.9	9,490	158.2
OP 31	6,511	108.5	8,343	139.1
OP 32	3,318	55.3	4,856	80.9
OP 33	201,258	3,354.3	53,865	897.8
OP 34	0	0.0	0	0.0
OP 35	1,948	32.5	0	0.0
OP 36	1,966	32.8	2,423	40.4
OP 37	6,835	113.9	9,105	151.8
OP 38	5,820	97.0	9,509	158.5

PV: PV array 1 potential temporary after-image

Receptor results ordered by category of glare

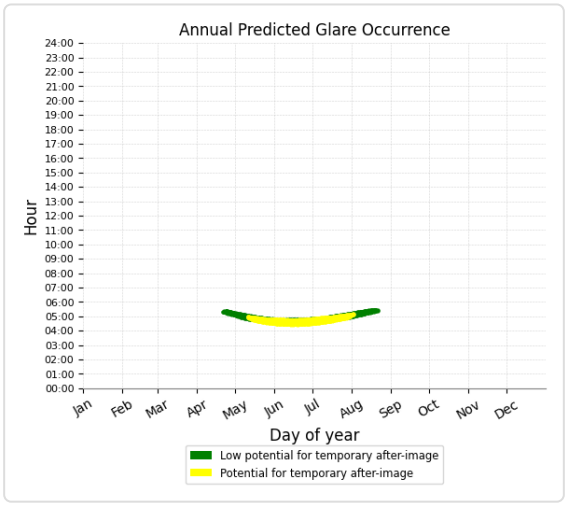
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	599	10.0	1,431	23.9
B6094 and Ruddle Lane	1,410	23.5	1,366	22.8
M18	2,226	37.1	367	6.1
B6093	0	0.0	0	0.0
OP 7	1,080	18.0	800	13.3
OP 8	644	10.7	1,481	24.7
OP 9	615	10.2	1,493	24.9
OP 11	580	9.7	88	1.5
OP 12	540	9.0	43	0.7
OP 17	757	12.6	913	15.2
OP 29	2,475	41.2	753	12.6
OP 30	2,491	41.5	1,498	25.0
OP 31	2,484	41.4	1,684	28.1
OP 32	829	13.8	1,189	19.8
OP 33	823	13.7	1,505	25.1
OP 37	2,496	41.6	1,722	28.7
OP 38	2,383	39.7	1,380	23.0
OP 2	398	6.6	0	0.0
OP 3	883	14.7	0	0.0
OP 13	208	3.5	0	0.0
OP 14	187	3.1	0	0.0
OP 15	148	2.5	0	0.0
OP 16	108	1.8	0	0.0
OP 18	149	2.5	0	0.0
OP 22	2,007	33.5	0	0.0
OP 26	30	0.5	0	0.0
OP 35	948	15.8	0	0.0
OP 36	1,067	17.8	0	0.0
OP 1	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 23	0	0.0	0	0.0

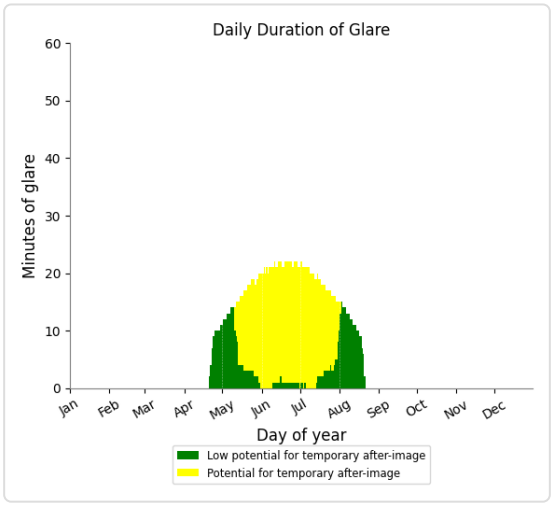
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 34	0	0.0	0	0.0

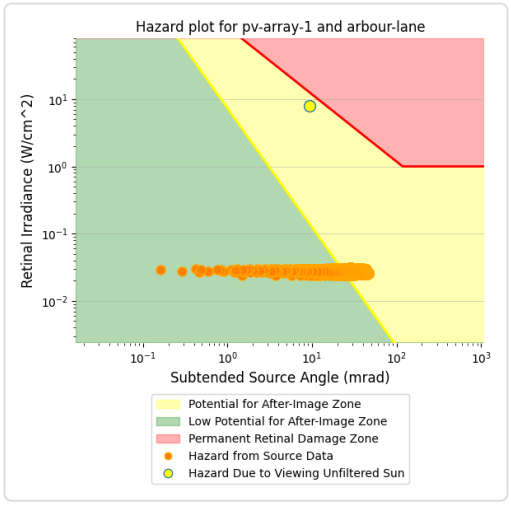
PV array 1 and Route: Arbour lane

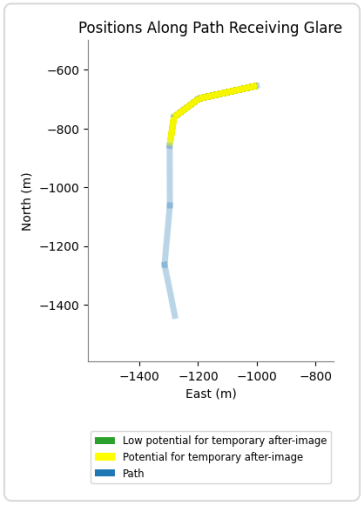
Yellow glare: 1,431 min.

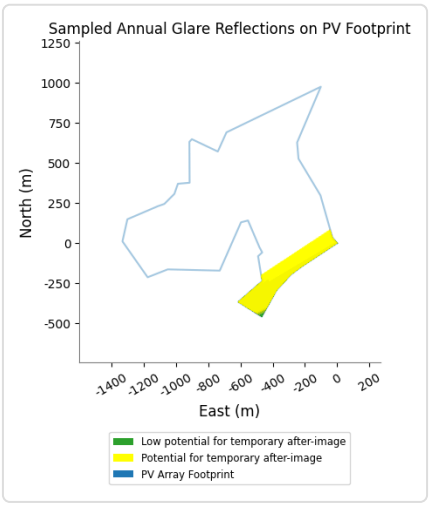
Green glare: 599 min.







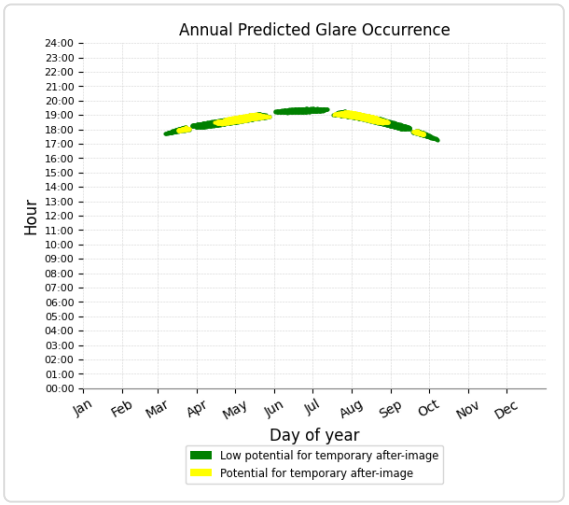


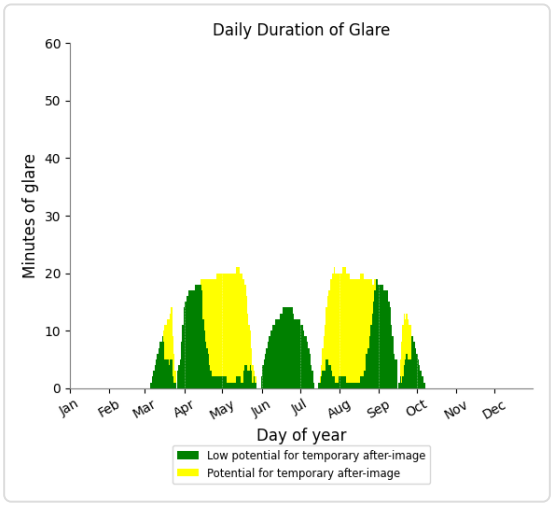


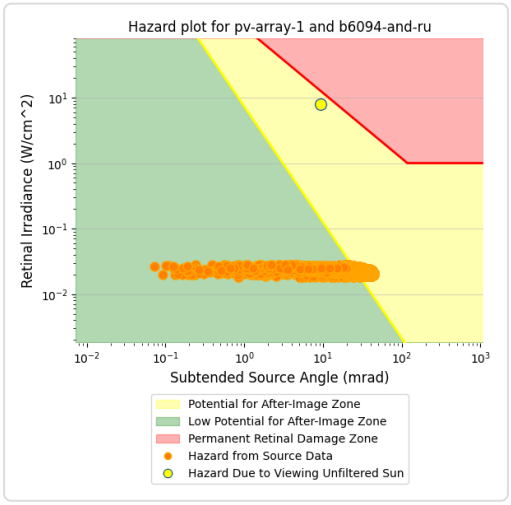
PV array 1 and Route: B6094 and Ruddle Lane

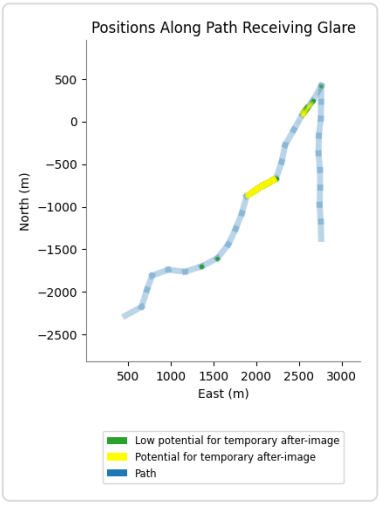
Yellow glare: 1,366 min.

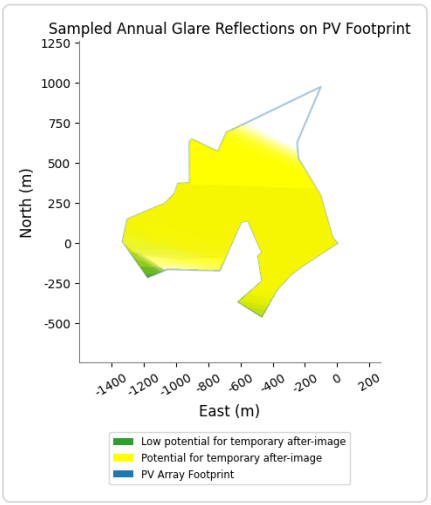
Green glare: 1,410 min.







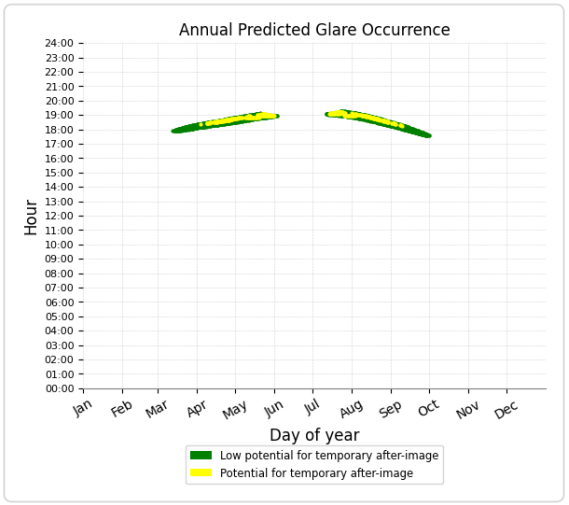


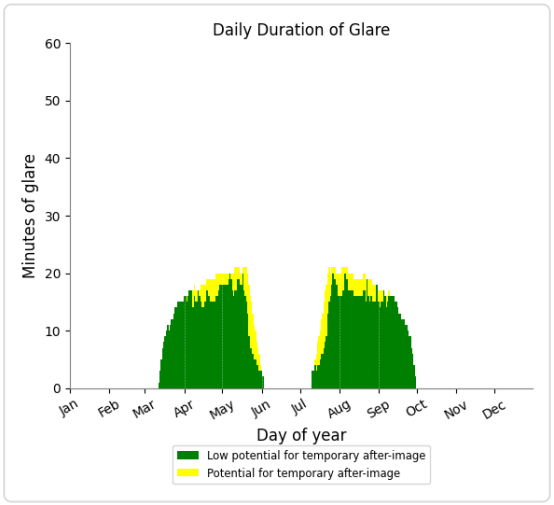


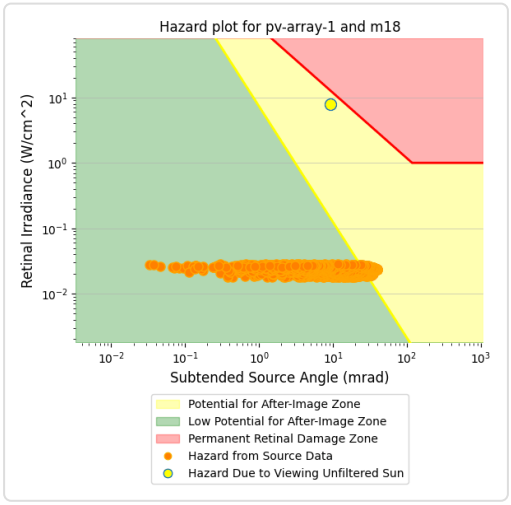
PV array 1 and Route: M18

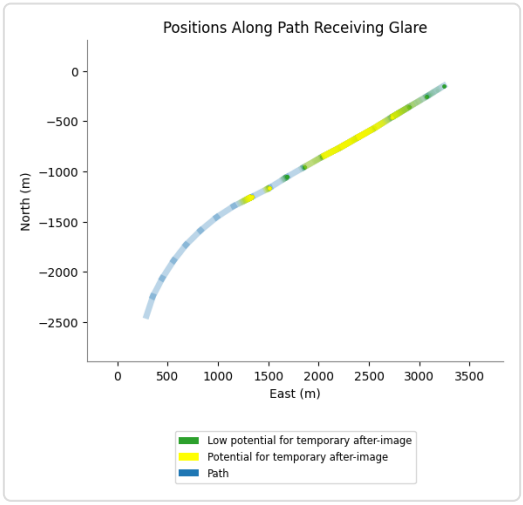
Yellow glare: 367 min.

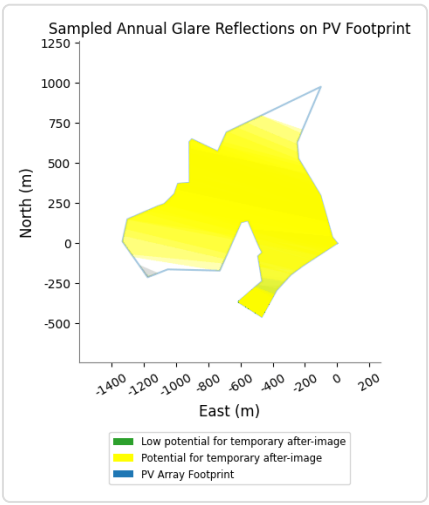
Green glare: 2,226 min.











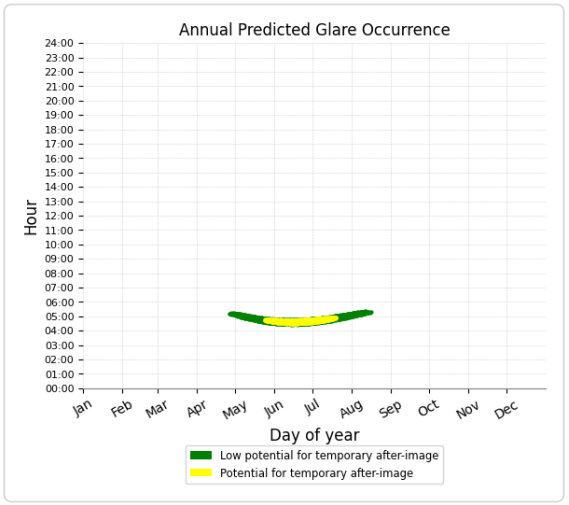
PV array 1 and Route: B6093

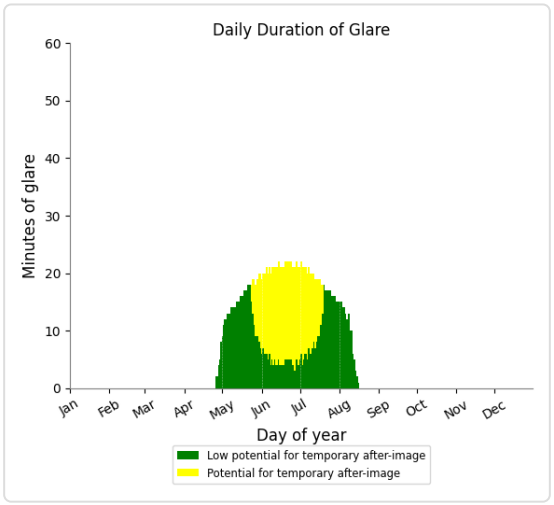
No glare found

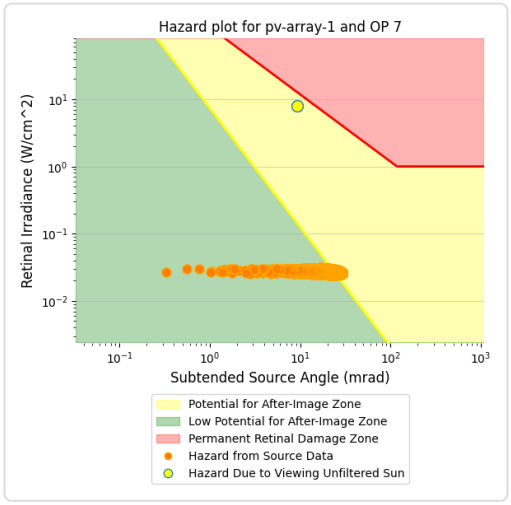
PV array 1 and OP 7

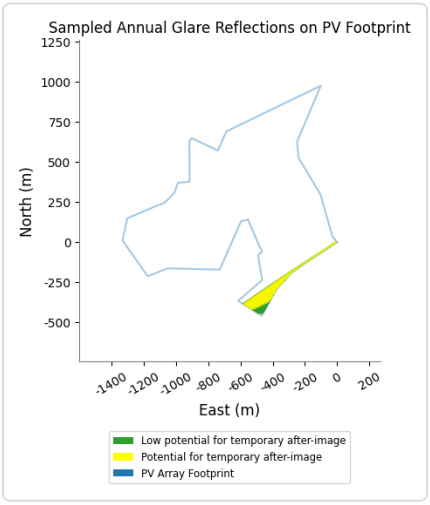
Yellow glare: 800 min.

Green glare: 1,080 min.





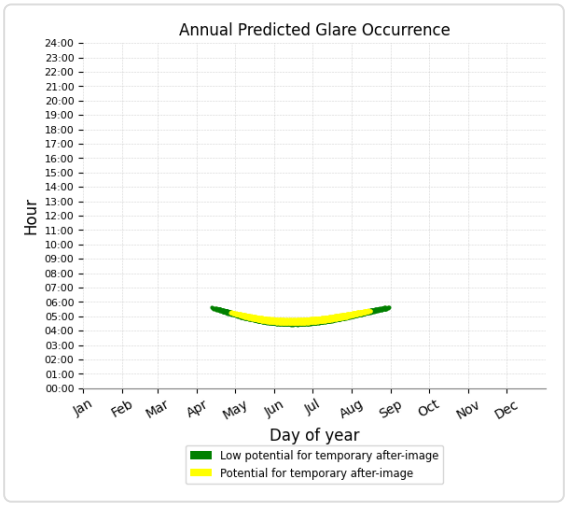


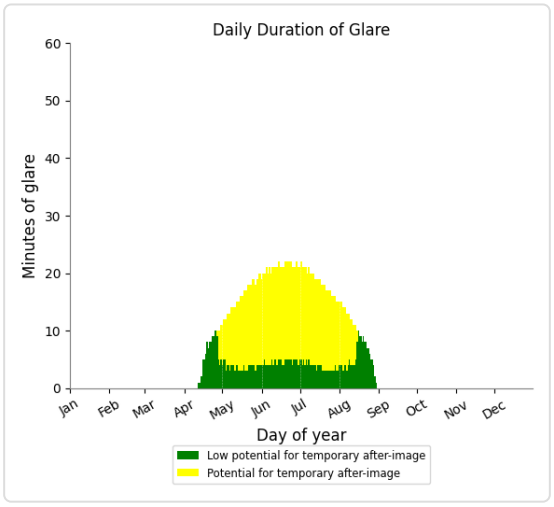


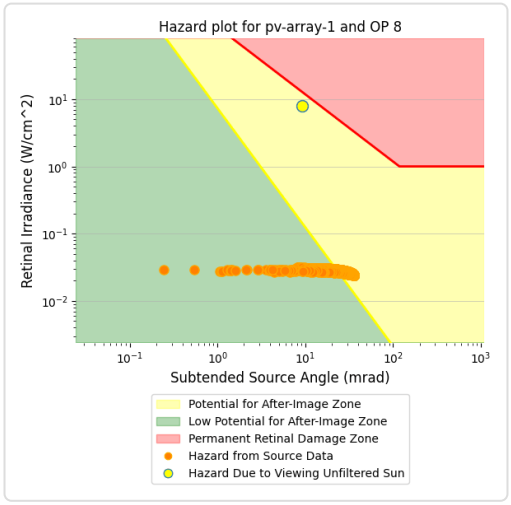
PV array 1 and OP 8

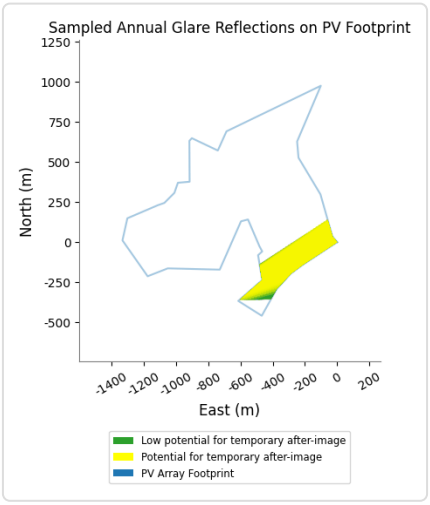
Yellow glare: 1,481 min.

Green glare: 644 min.





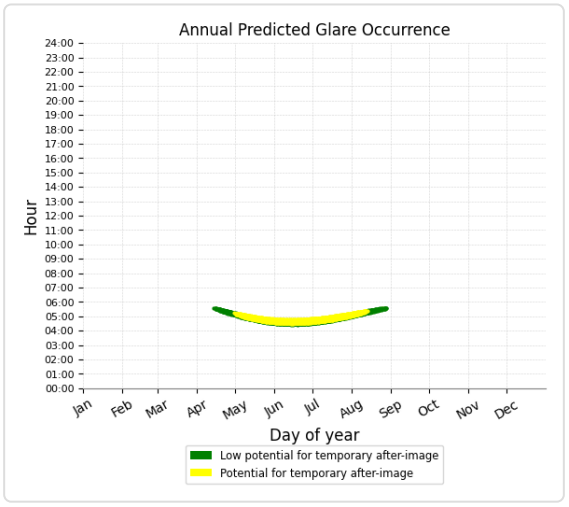


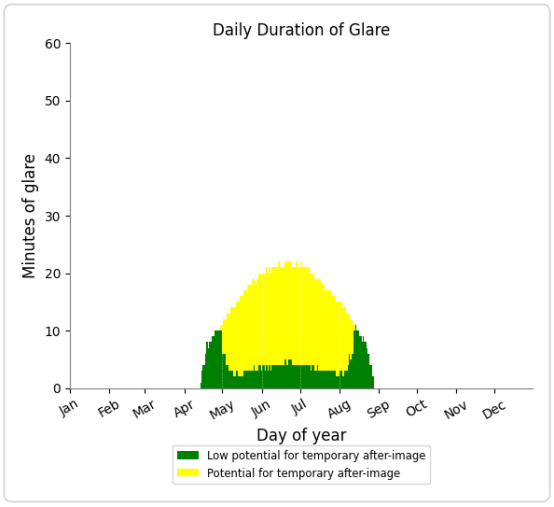


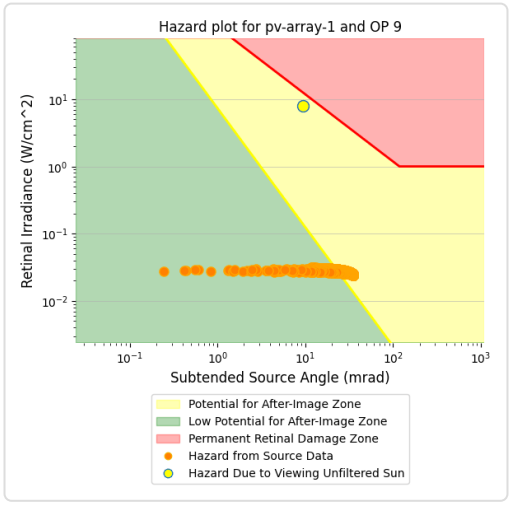
PV array 1 and OP 9

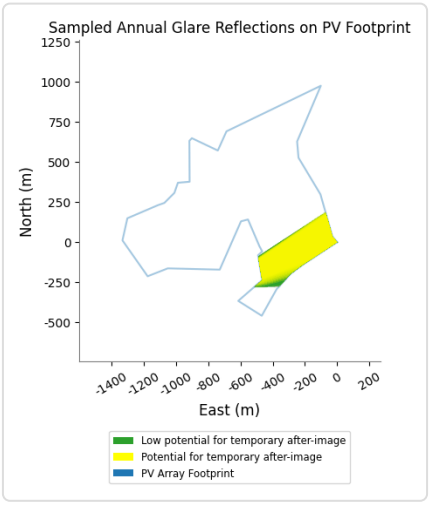
Yellow glare: 1,493 min.

Green glare: 615 min.





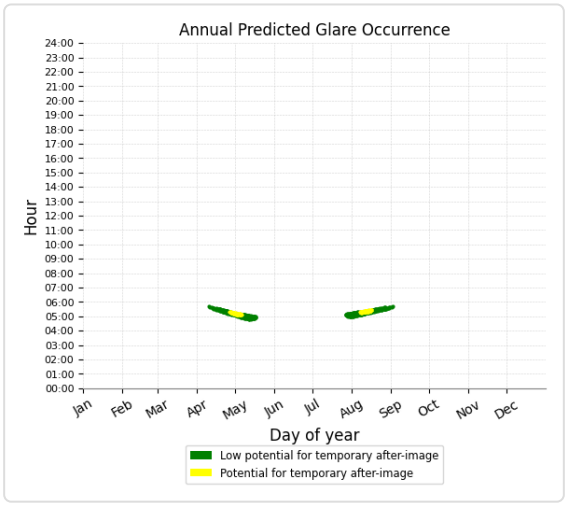


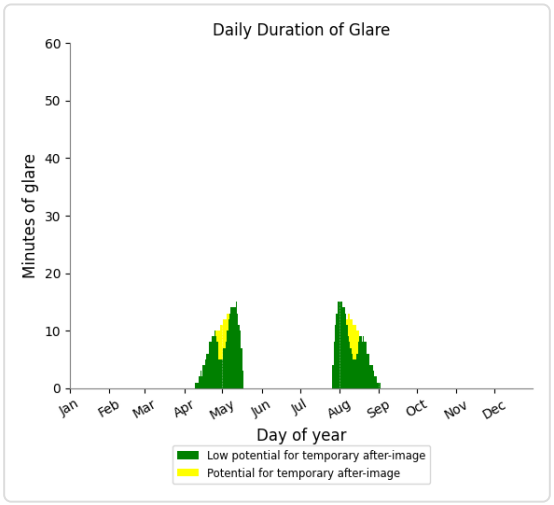


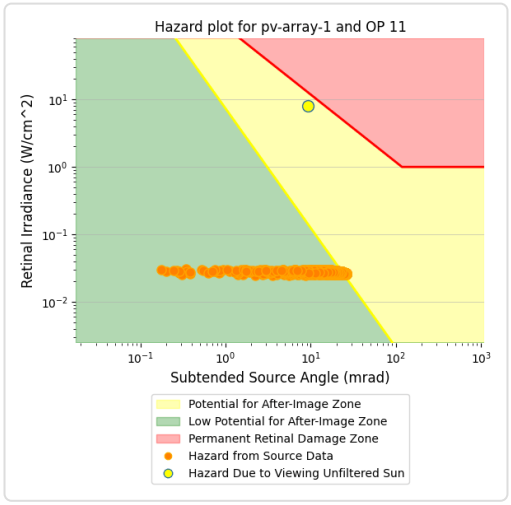
PV array 1 and OP 11

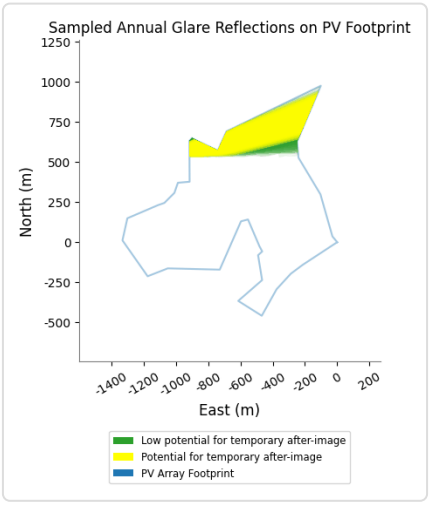
Yellow glare: 88 min.

Green glare: 580 min.





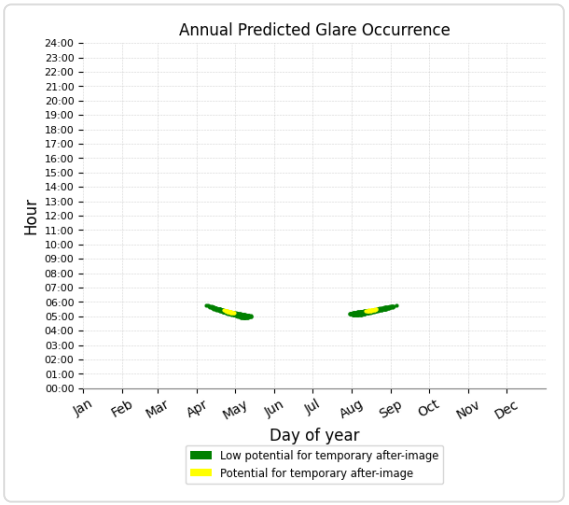


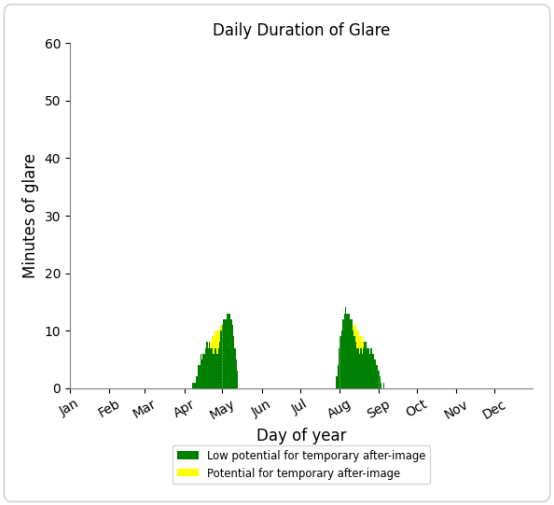


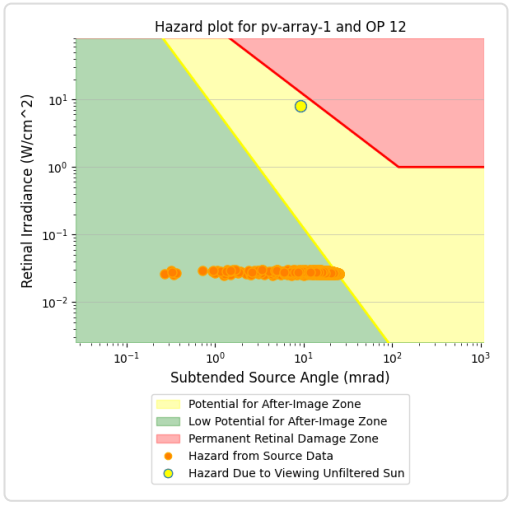
PV array 1 and OP 12

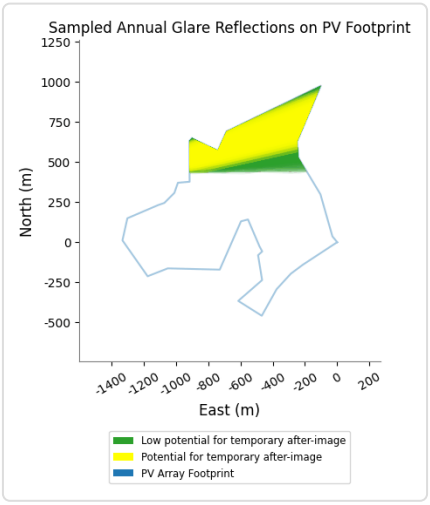
Yellow glare: 43 min.

Green glare: 540 min.





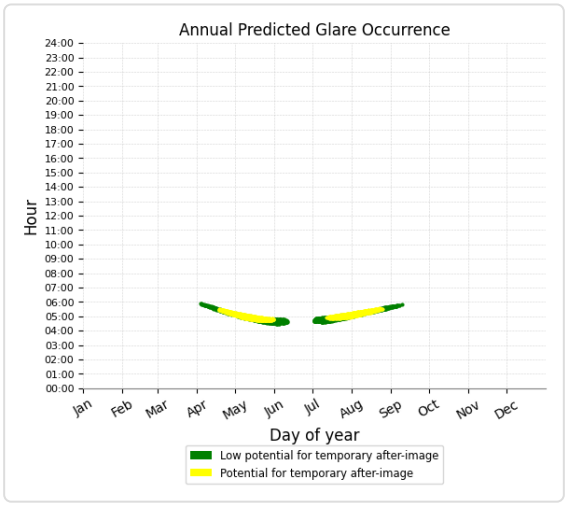


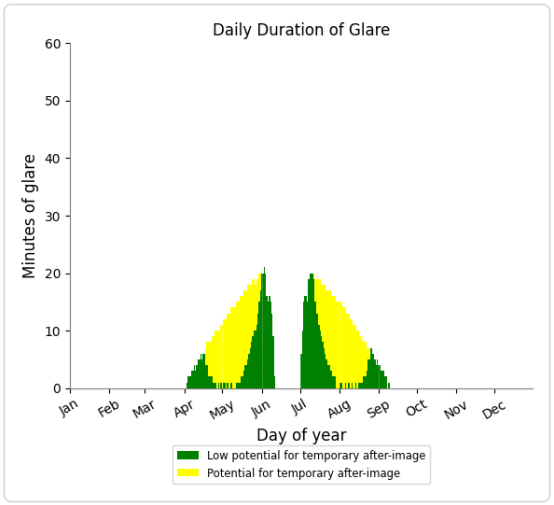


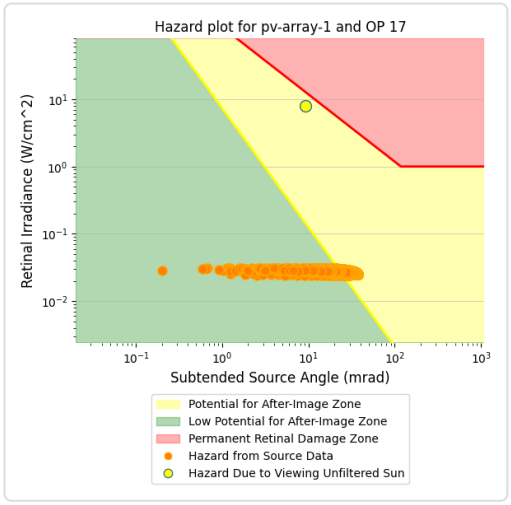
PV array 1 and OP 17

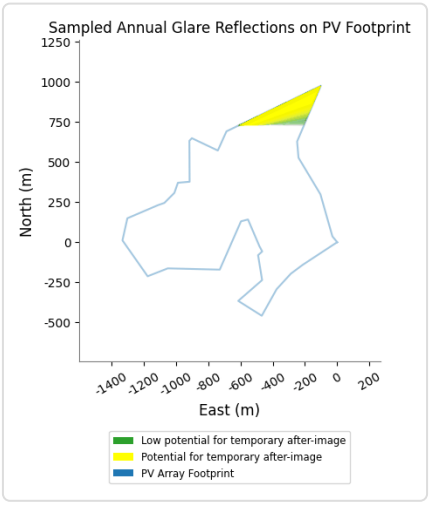
Yellow glare: 913 min.

Green glare: 757 min.





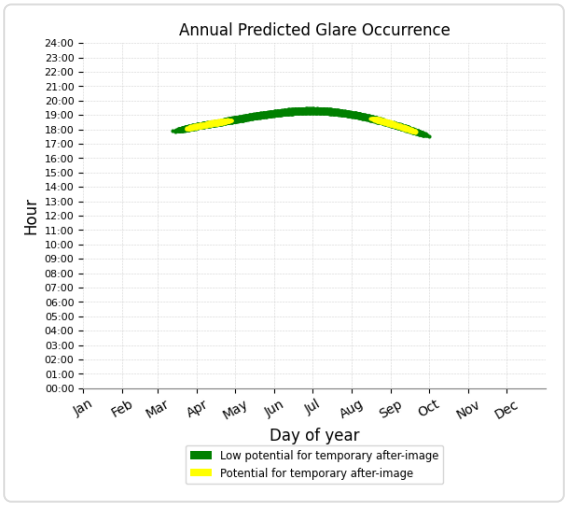


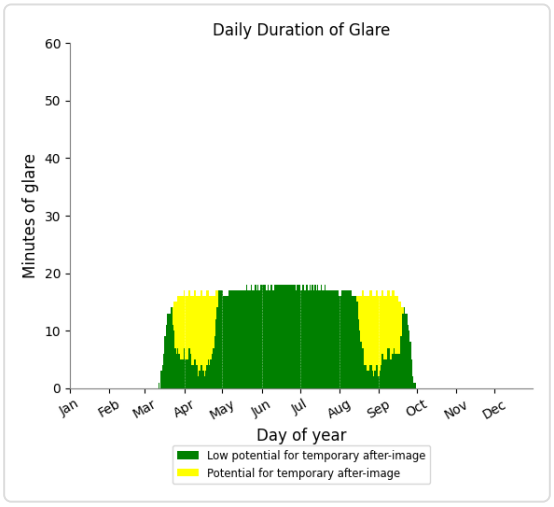


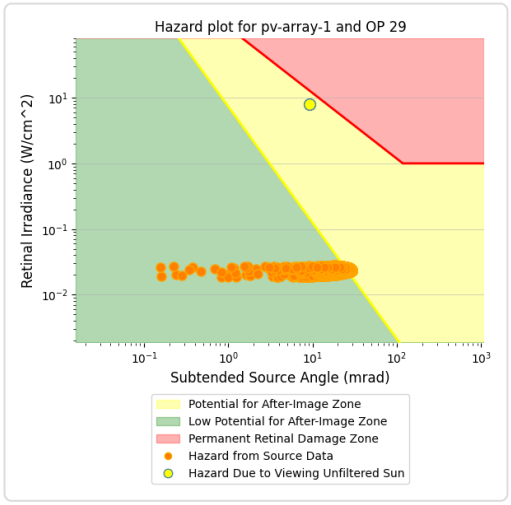
PV array 1 and OP 29

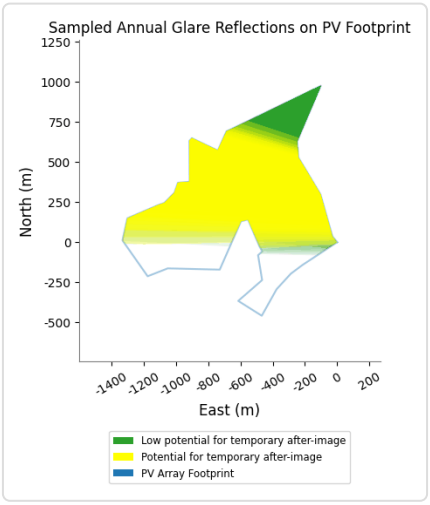
Yellow glare: 753 min.

Green glare: 2,475 min.





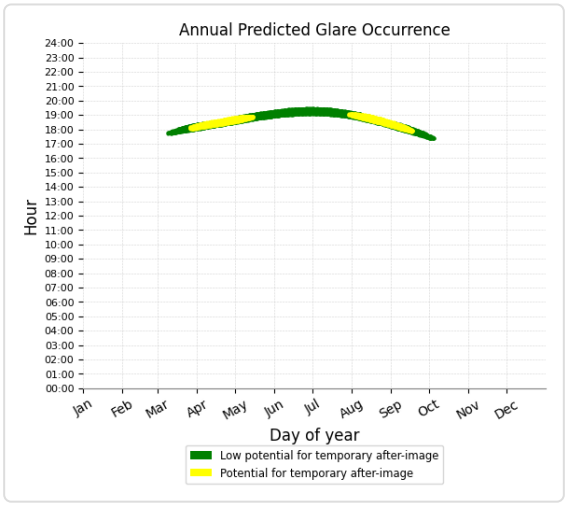


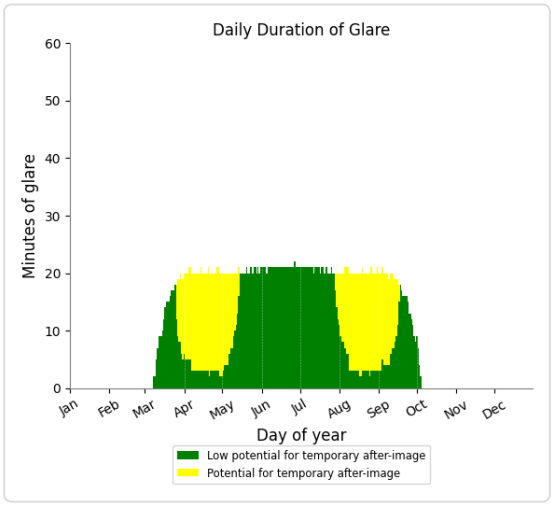


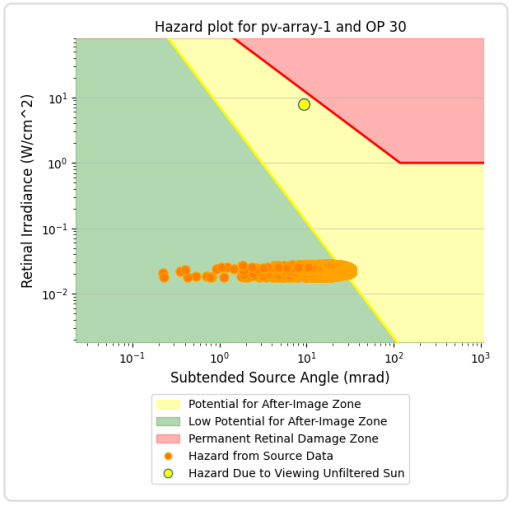
PV array 1 and OP 30

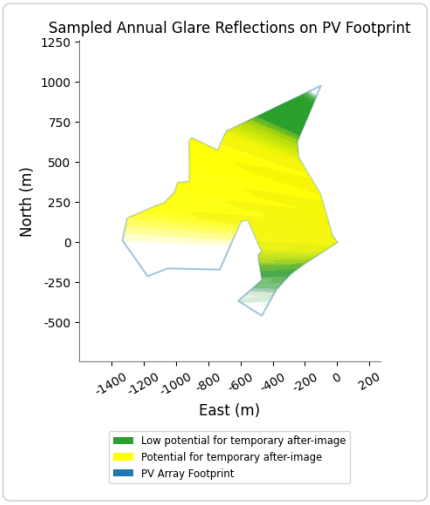
Yellow glare: 1,498 min.

Green glare: 2,491 min.





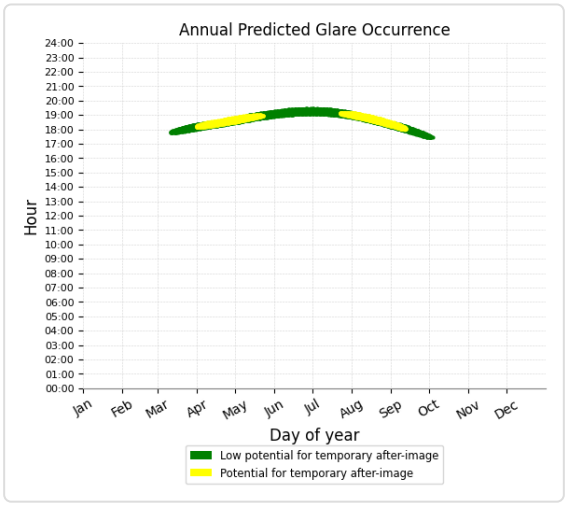


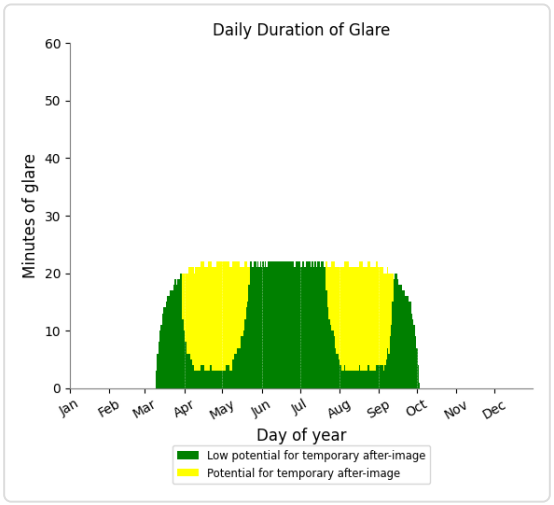


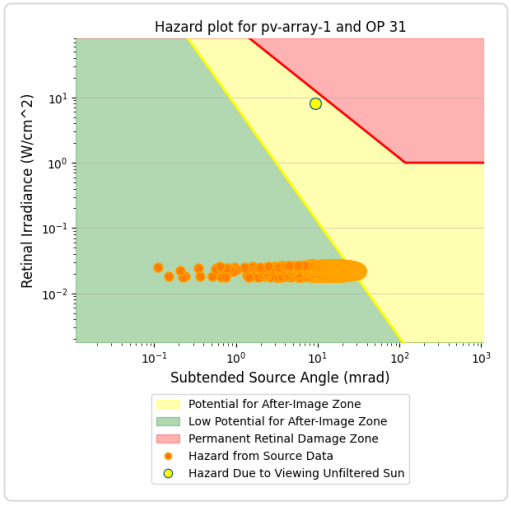
PV array 1 and OP 31

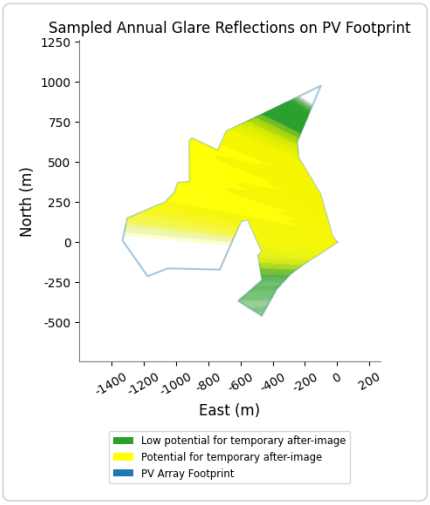
Yellow glare: 1,684 min.

Green glare: 2,484 min.





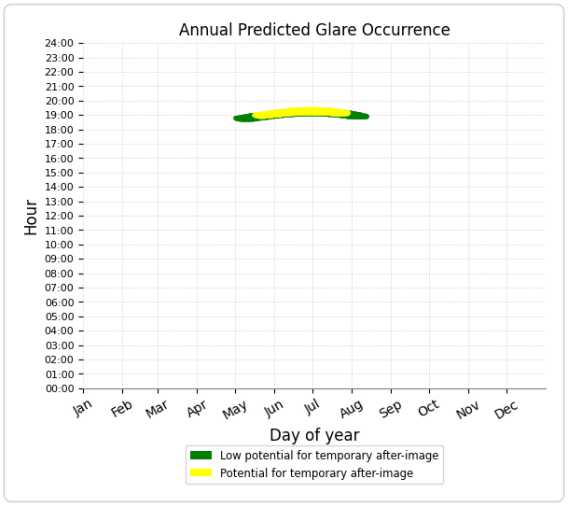


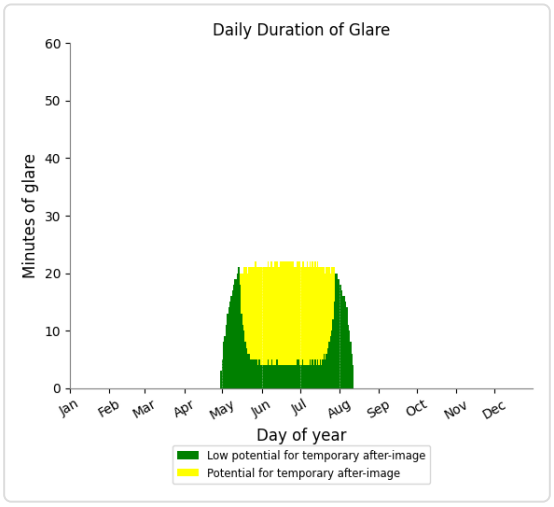


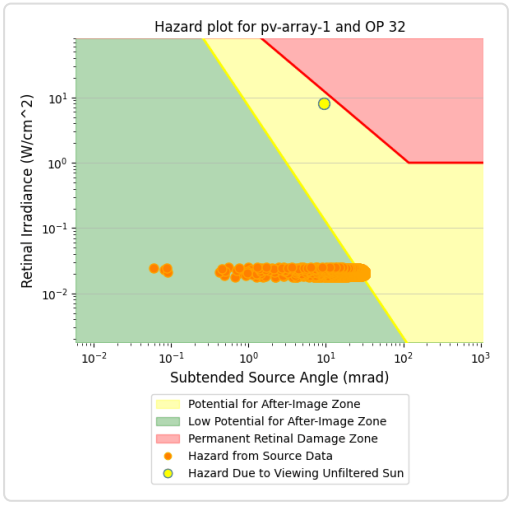
PV array 1 and OP 32

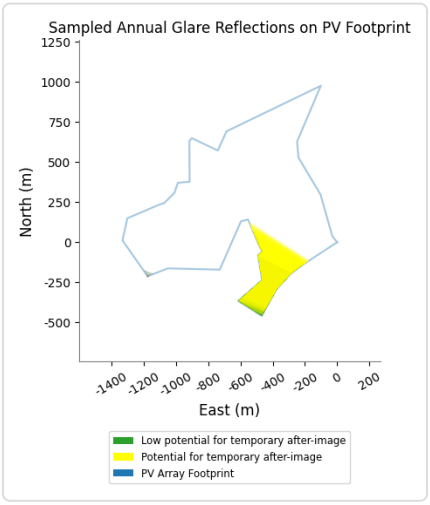
Yellow glare: 1,189 min.

Green glare: 829 min.





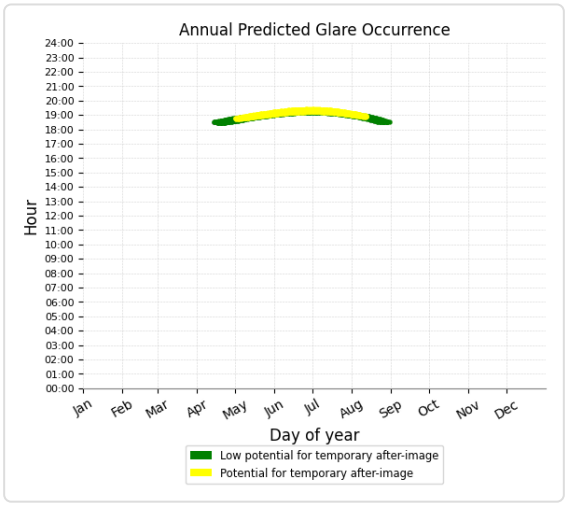


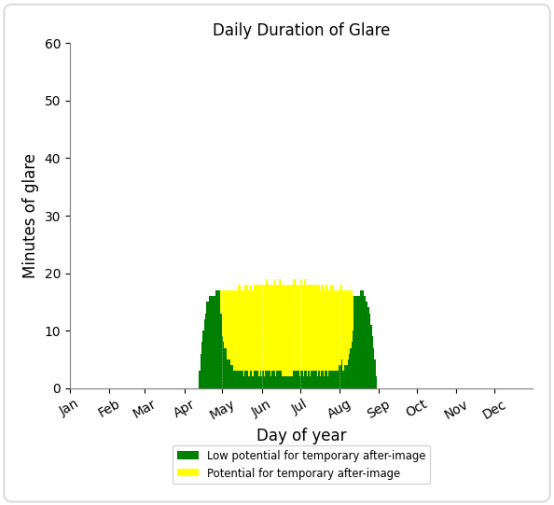


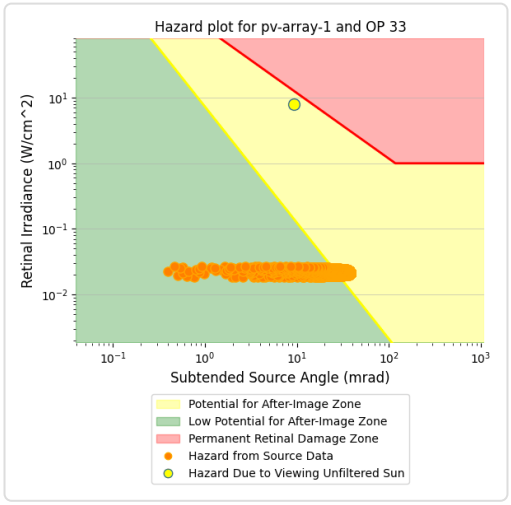
PV array 1 and OP 33

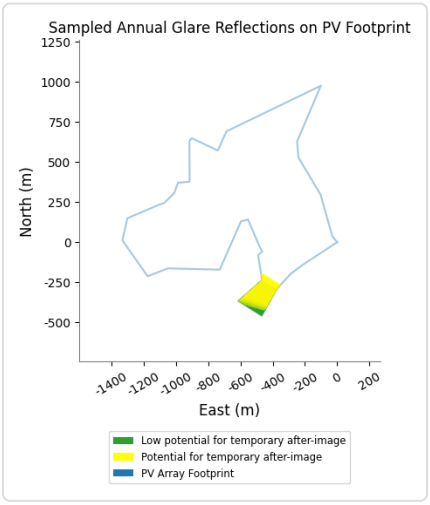
Yellow glare: 1,505 min.

Green glare: 823 min.





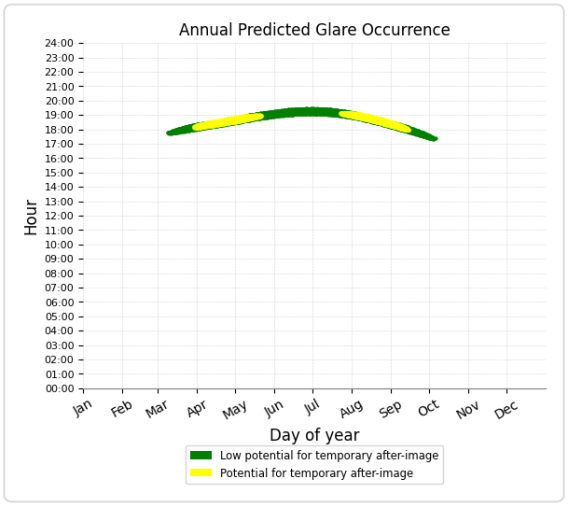


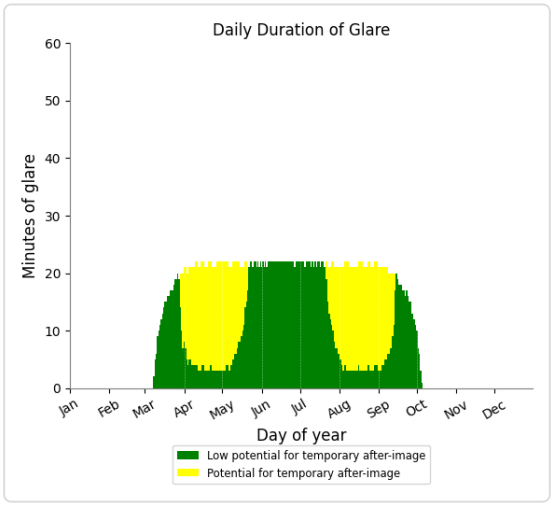


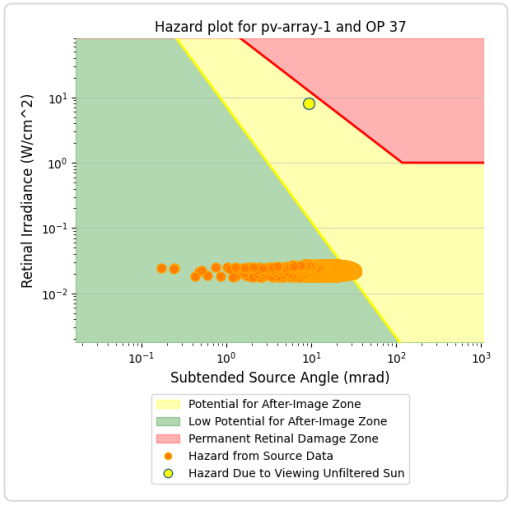
PV array 1 and OP 37

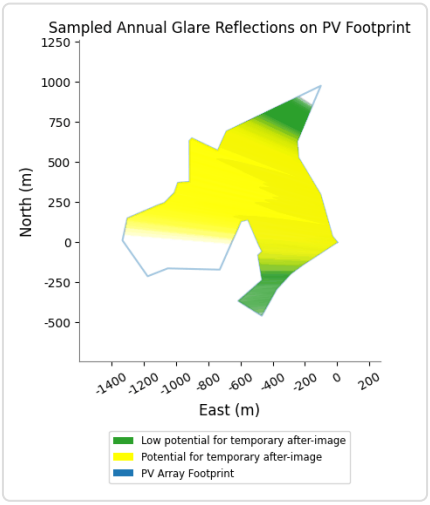
Yellow glare: 1,722 min.

Green glare: 2,496 min.





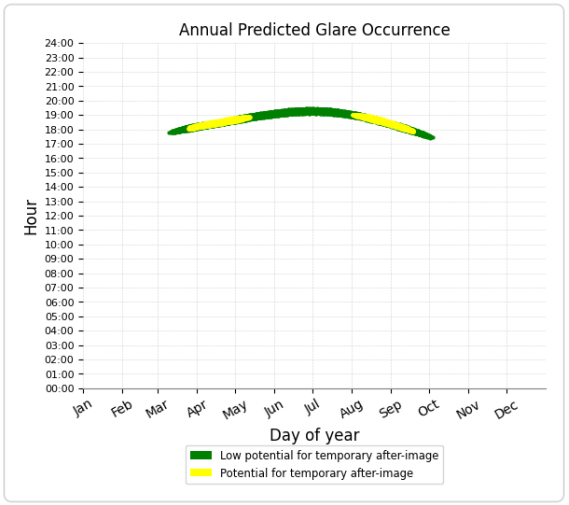


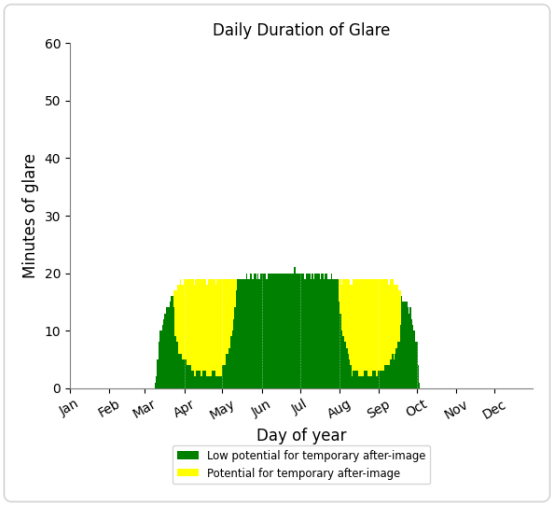


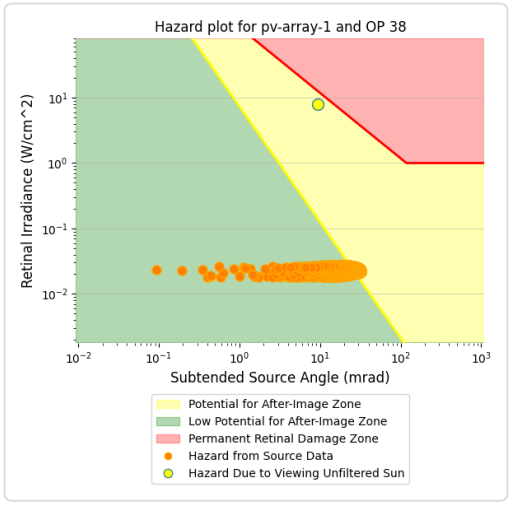
PV array 1 and OP 38

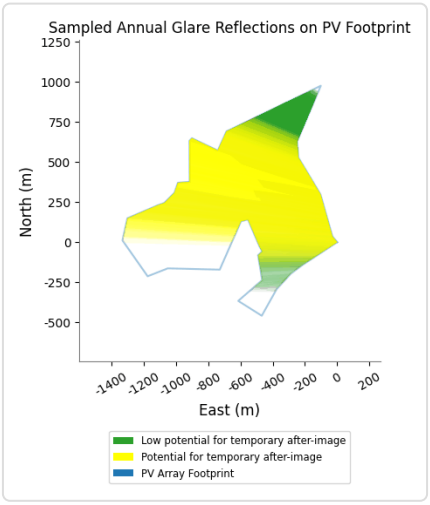
Yellow glare: 1,380 min.

Green glare: 2,383 min.





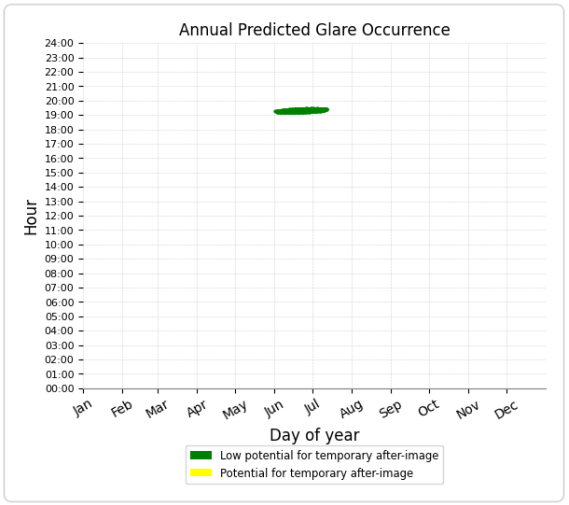


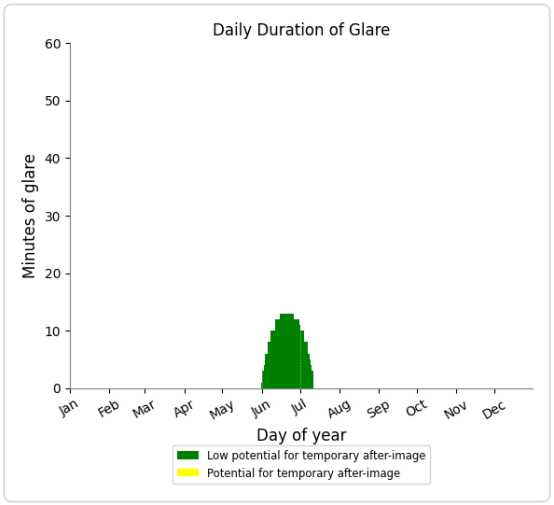


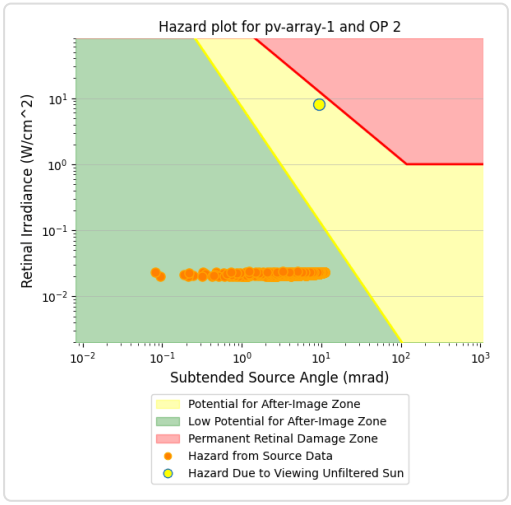
PV array 1 and OP 2

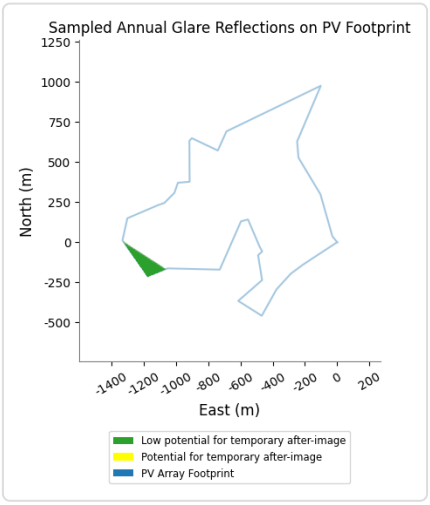
Yellow glare: none

Green glare: 398 min.





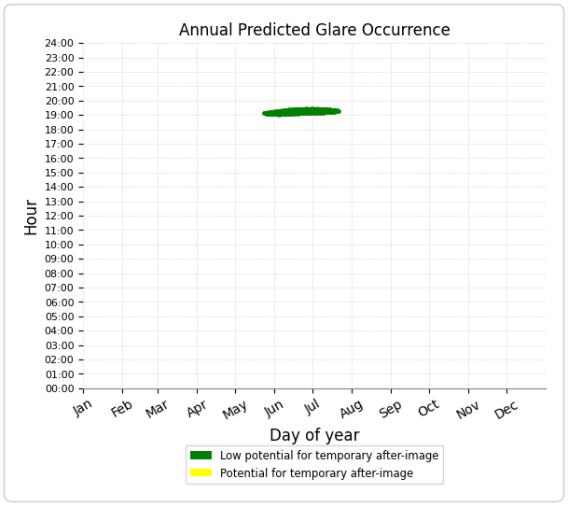


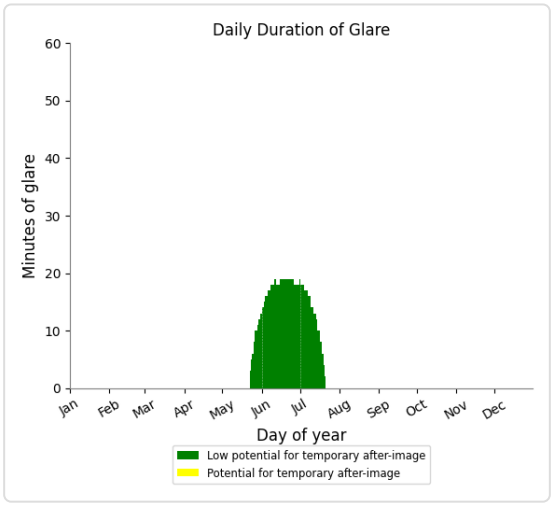


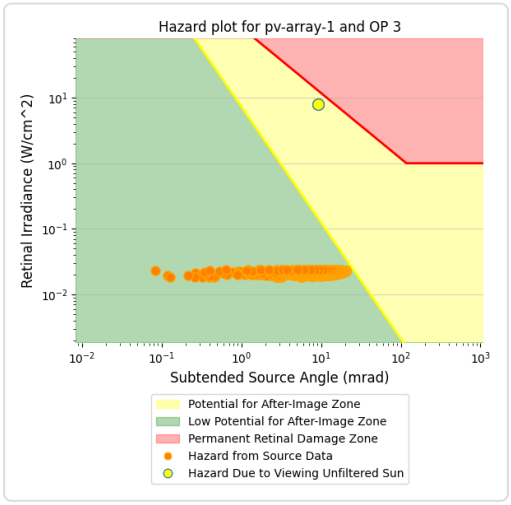
PV array 1 and OP 3

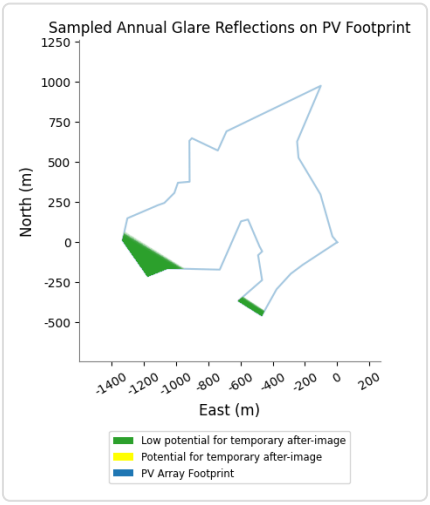
Yellow glare: none

Green glare: 883 min.





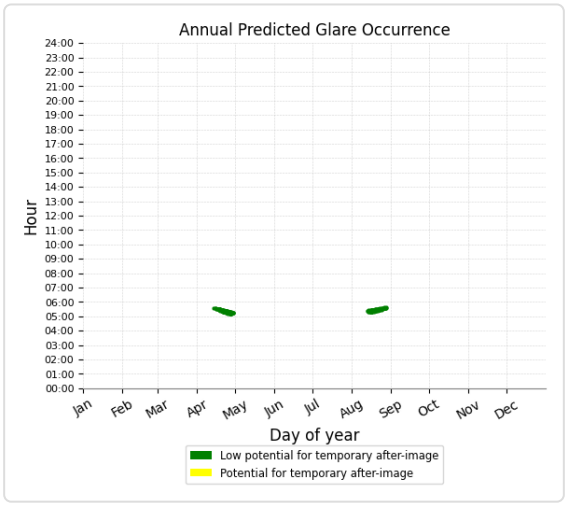


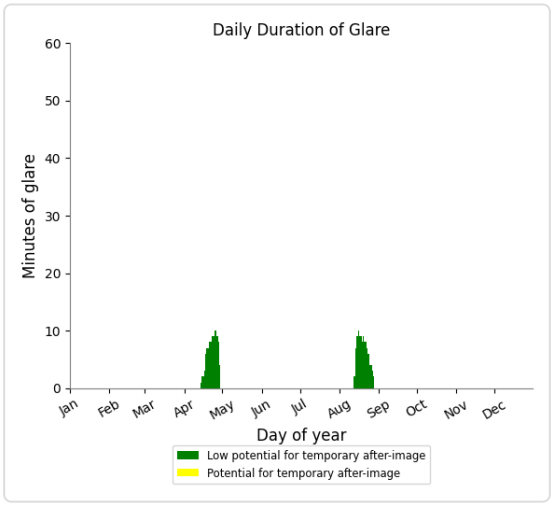


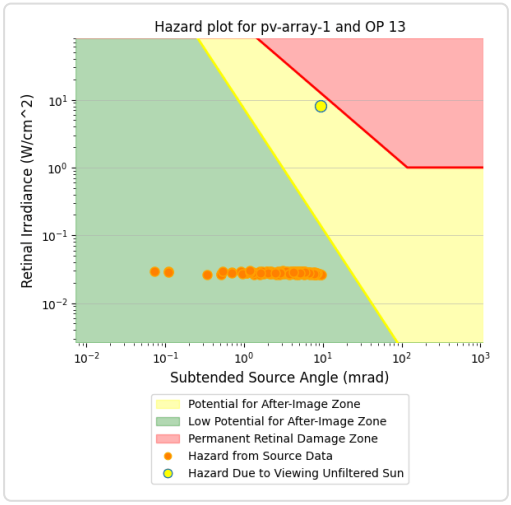
PV array 1 and OP 13

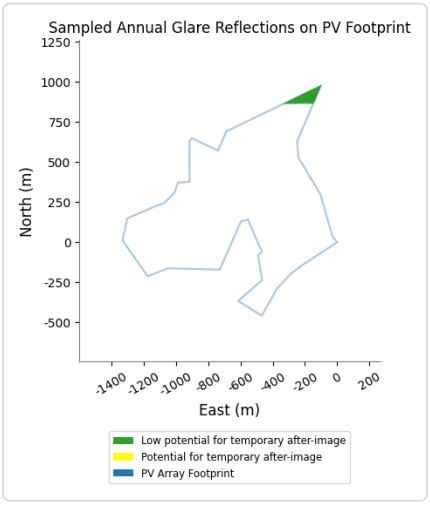
Yellow glare: none

Green glare: 208 min.





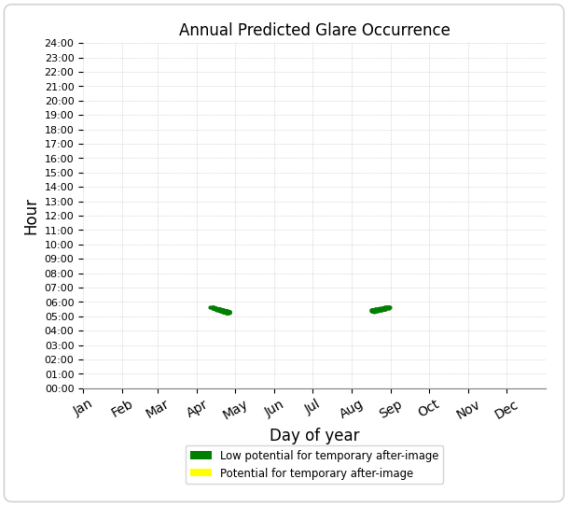


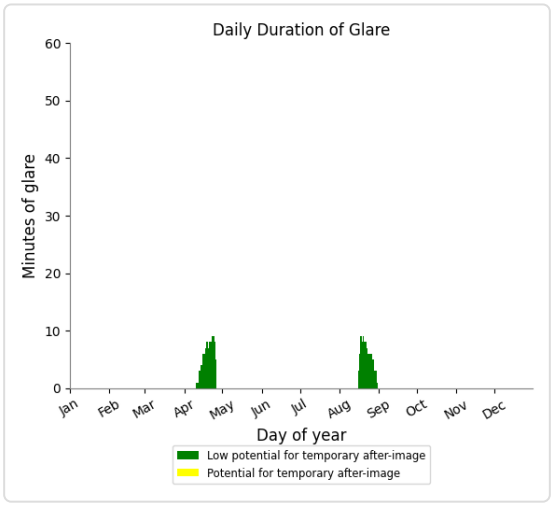


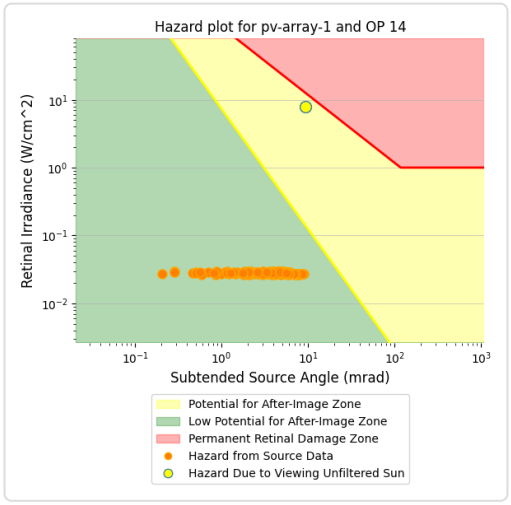
PV array 1 and OP 14

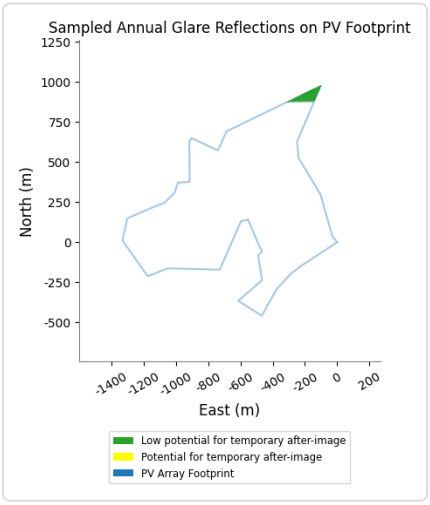
Yellow glare: none

Green glare: 187 min.





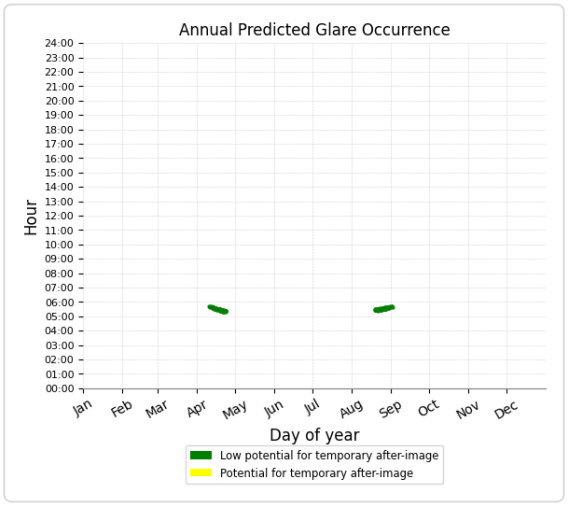


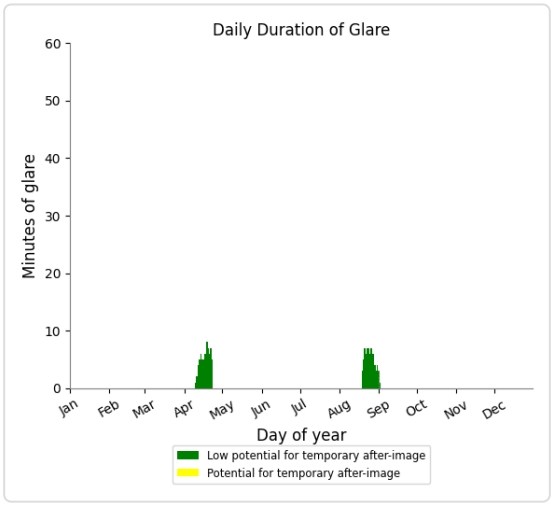


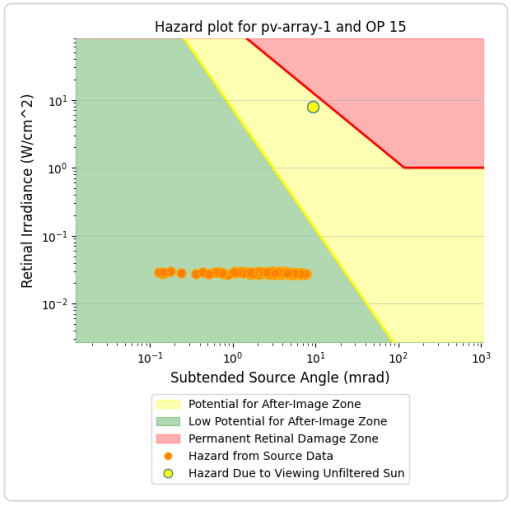
PV array 1 and OP 15

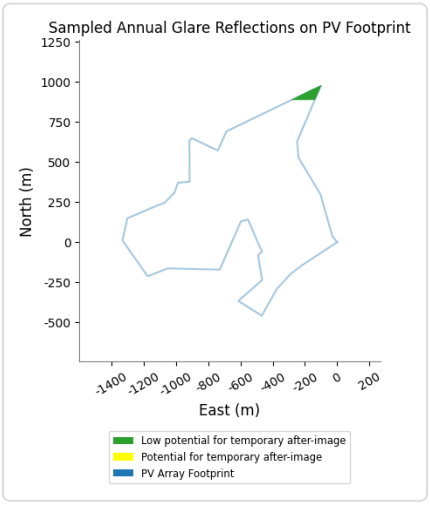
Yellow glare: none

Green glare: 148 min.





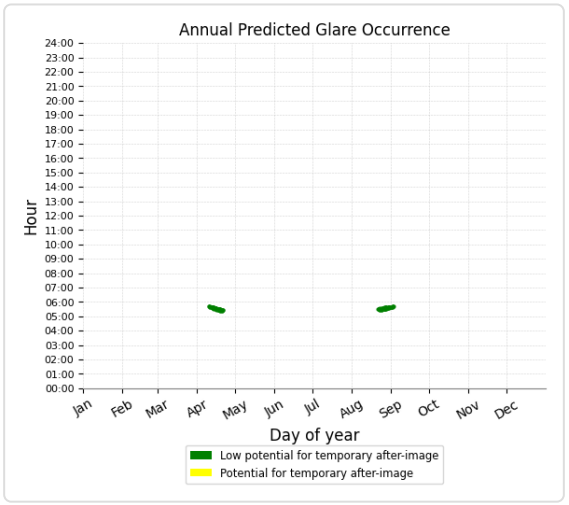


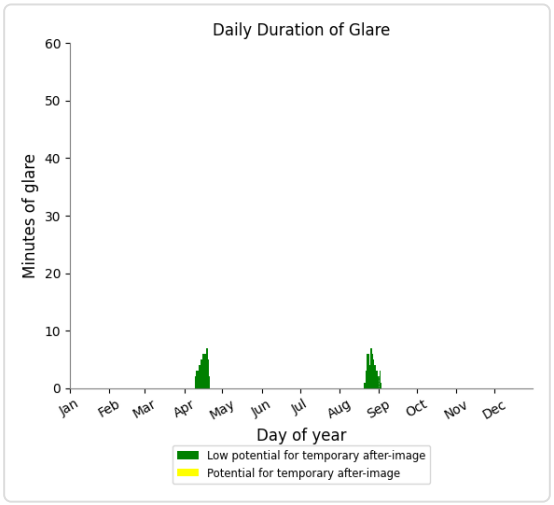


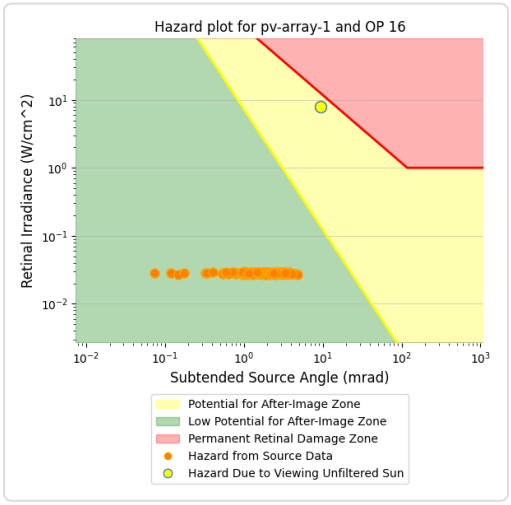
PV array 1 and OP 16

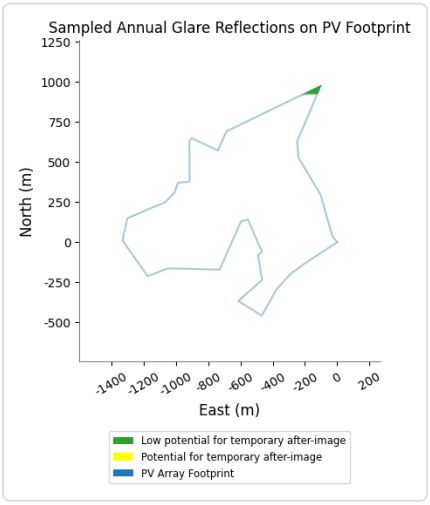
Yellow glare: none

Green glare: 108 min.





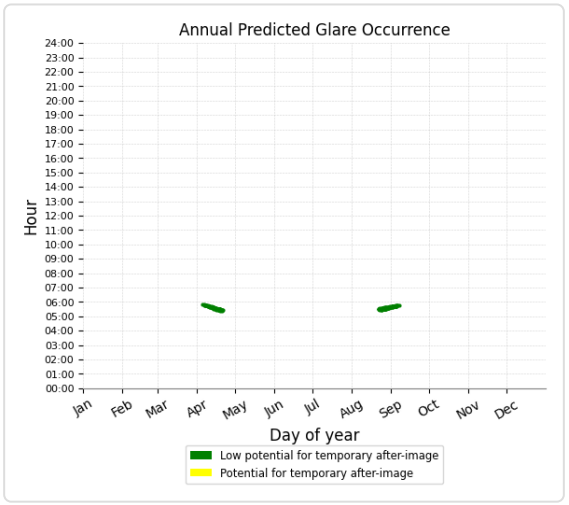


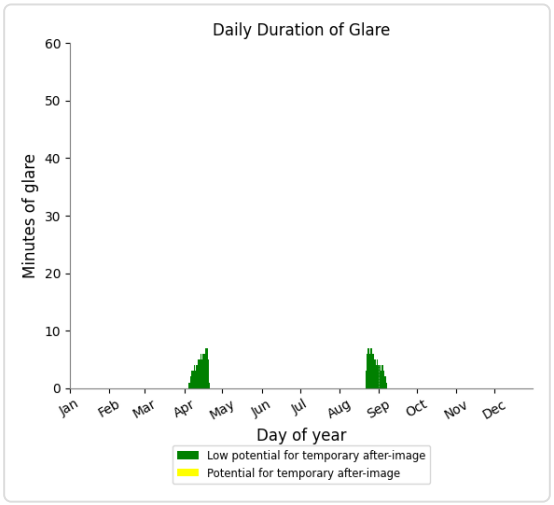


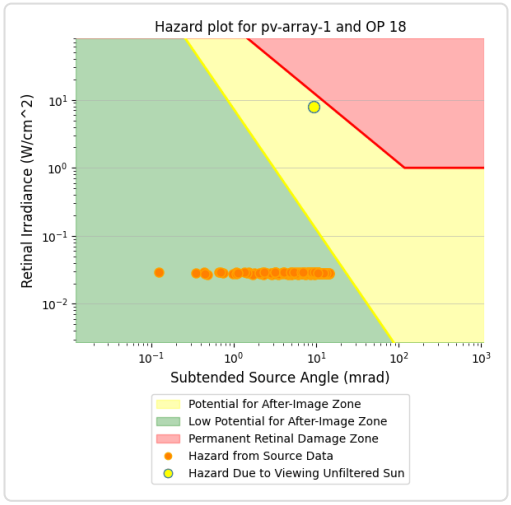
PV array 1 and OP 18

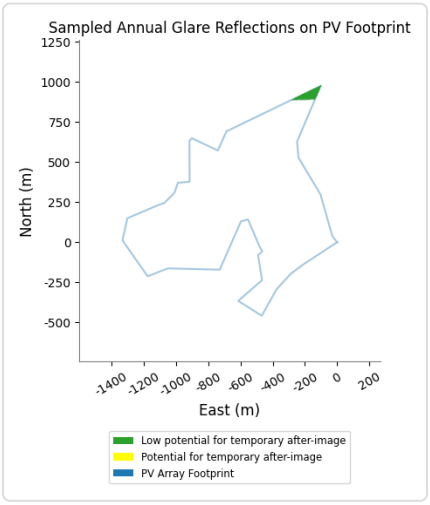
Yellow glare: none

Green glare: 149 min.





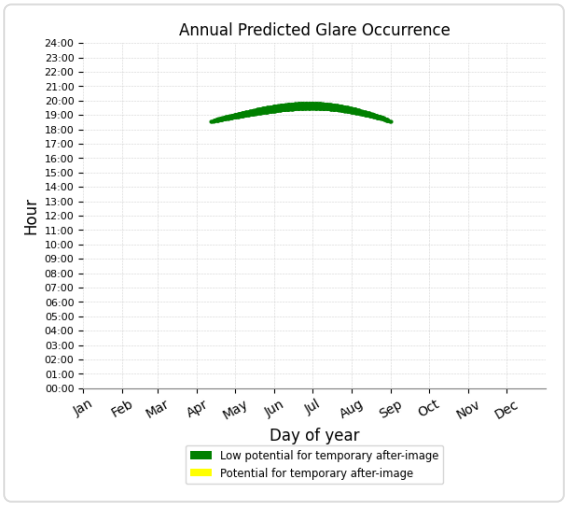


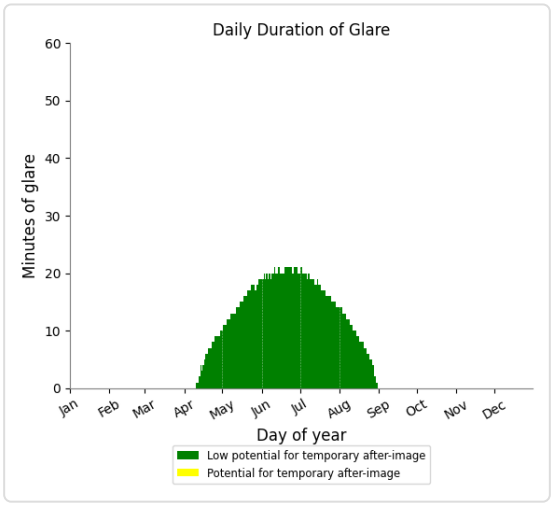


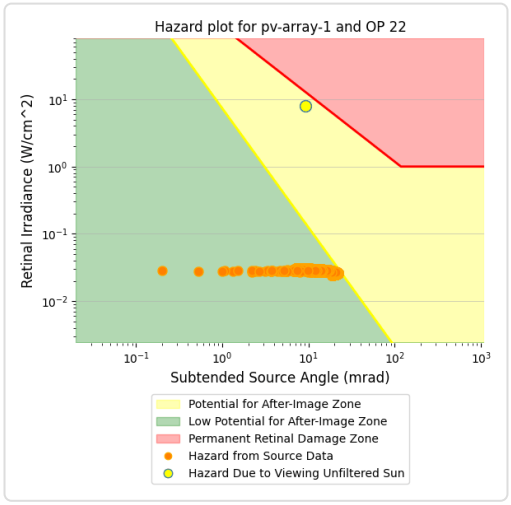
PV array 1 and OP 22

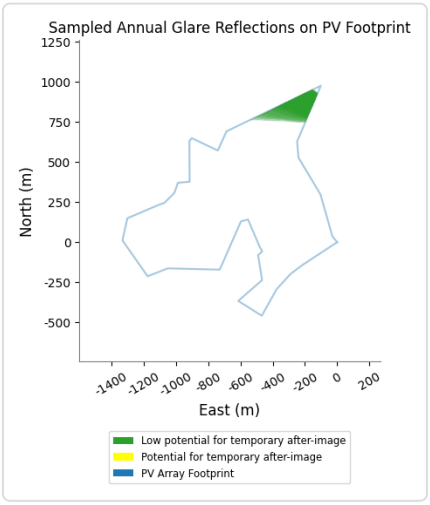
Yellow glare: none

Green glare: 2,007 min.





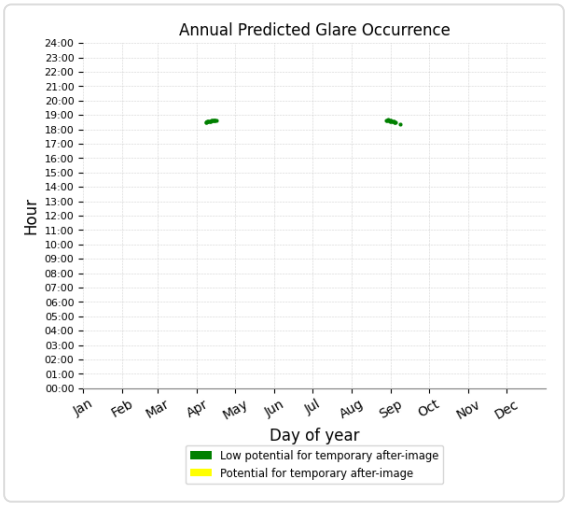


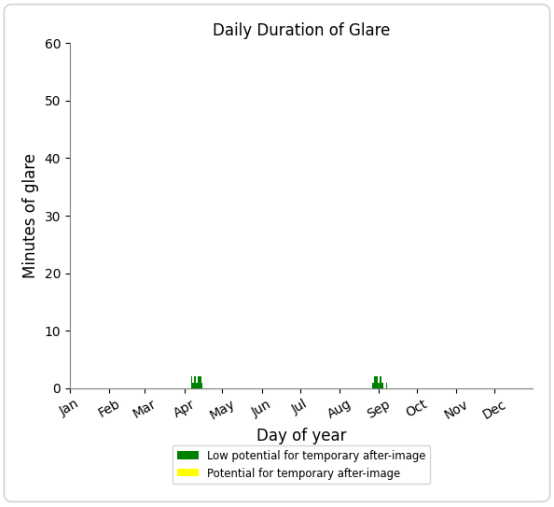


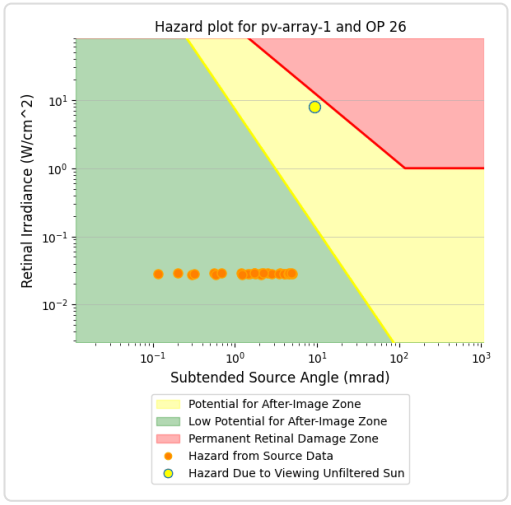
PV array 1 and OP 26

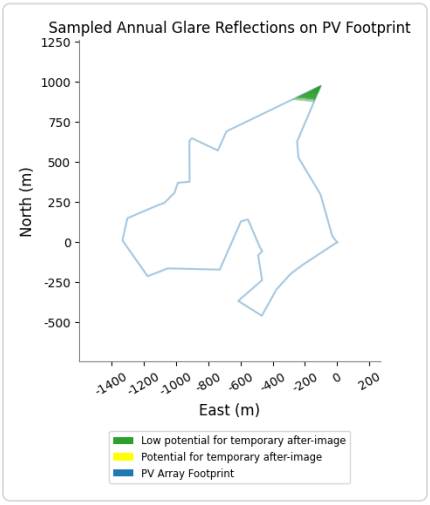
Yellow glare: none

Green glare: 30 min.





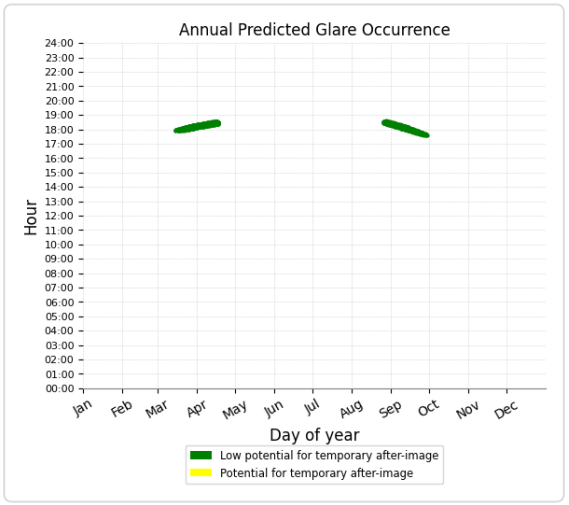


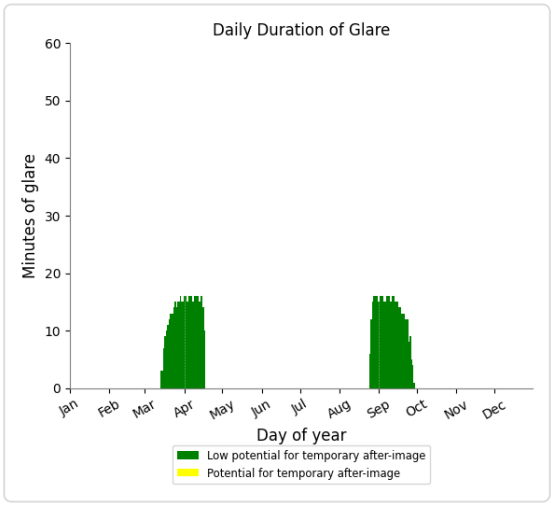


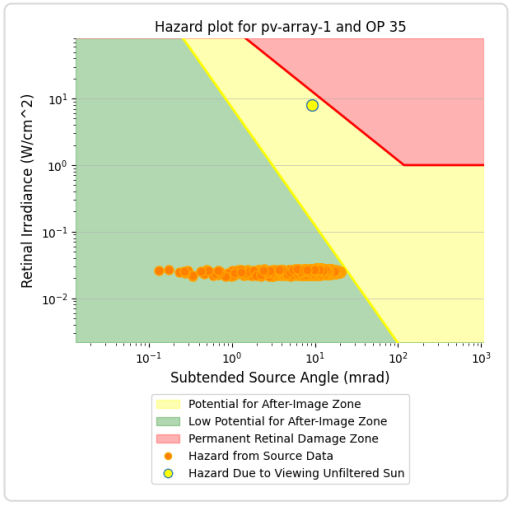
PV array 1 and OP 35

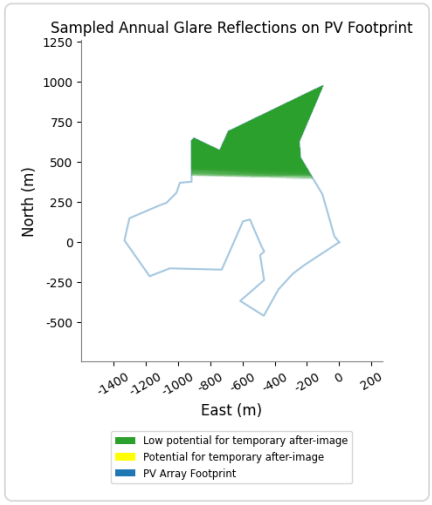
Yellow glare: none

Green glare: 948 min.





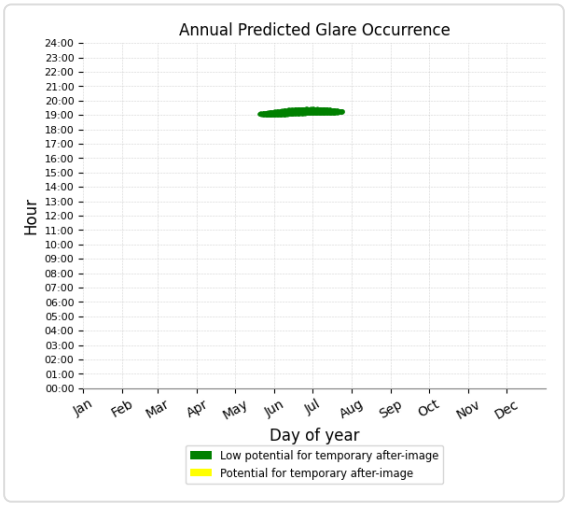


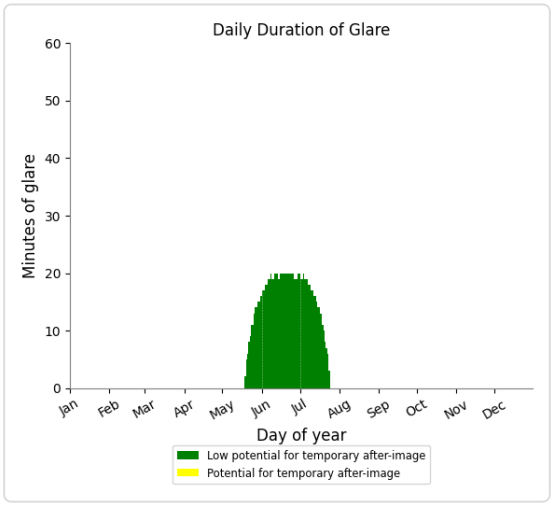


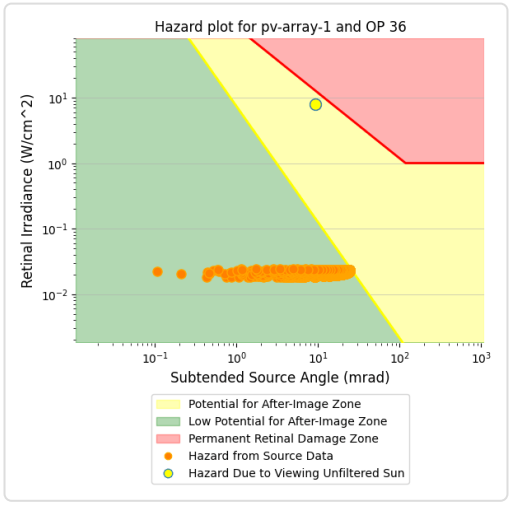
PV array 1 and OP 36

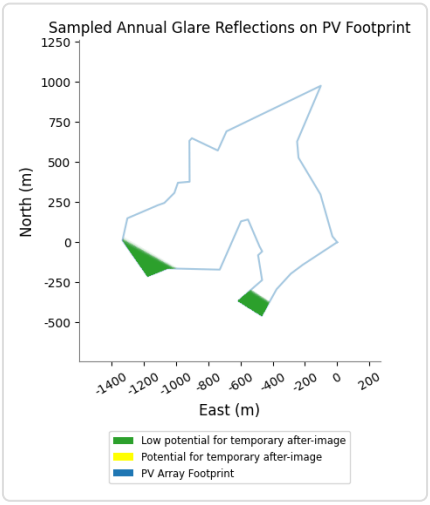
Yellow glare: none

Green glare: 1,067 min.









PV array 1 and OP 1

No glare found

PV array 1 and OP 4

No glare found

PV array 1 and OP 5

No glare found

PV array 1 and OP 6

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV array 1 and OP 27

No glare found

PV array 1 and OP 28

No glare found

PV array 1 and OP 34

No glare found

PV: PV array 2 potential temporary after-image

Receptor results ordered by category of glare

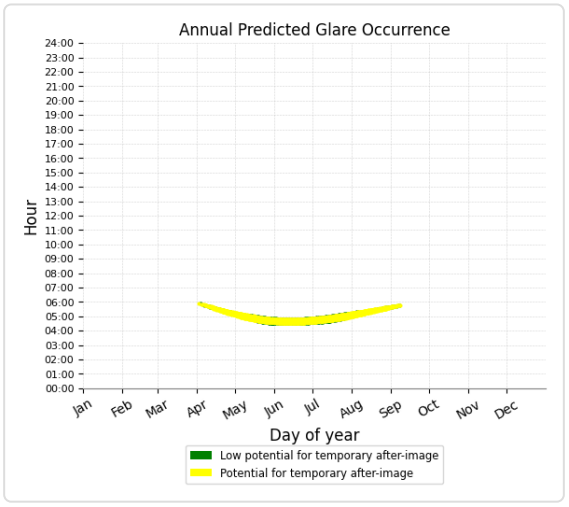
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	257	4.3	1,939	32.3
B6094 and Ruddle Lane	2,660	44.3	2,757	46.0
M18	1,632	27.2	2,568	42.8
B6093	0	0.0	0	0.0
OP 1	869	14.5	1,747	29.1
OP 2	893	14.9	2,287	38.1
OP 3	911	15.2	2,490	41.5
OP 4	1,173	19.6	356	5.9
OP 6	717	11.9	1,798	30.0
OP 7	349	5.8	1,770	29.5
OP 8	1,184	19.7	620	10.3
OP 9	891	14.8	1,020	17.0
OP 10	1,966	32.8	750	12.5
OP 29	1,119	18.6	4,546	75.8
OP 30	2,053	34.2	5,218	87.0
OP 31	2,000	33.3	5,280	88.0
OP 32	1,279	21.3	3,296	54.9
OP 33	197,012	3,283.5	50,612	843.5
OP 36	899	15.0	2,423	40.4
OP 37	2,207	36.8	5,540	92.3
OP 38	1,879	31.3	5,101	85.0
OP 5	456	7.6	0	0.0
OP 11	130	2.2	0	0.0
OP 12	148	2.5	0	0.0
OP 17	409	6.8	0	0.0
OP 22	413	6.9	0	0.0
OP 26	284	4.7	0	0.0
OP 35	1,000	16.7	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0

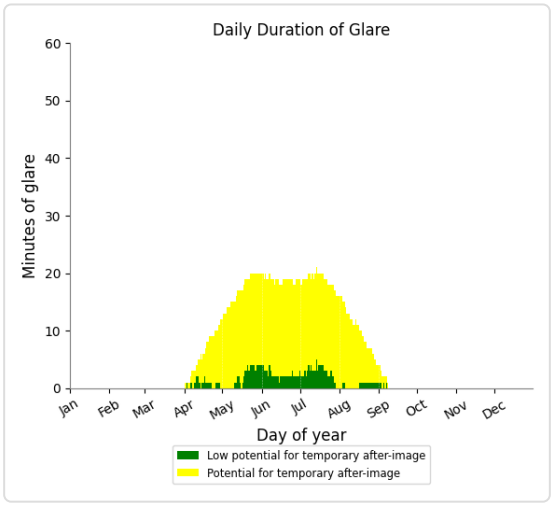
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 34	0	0.0	0	0.0

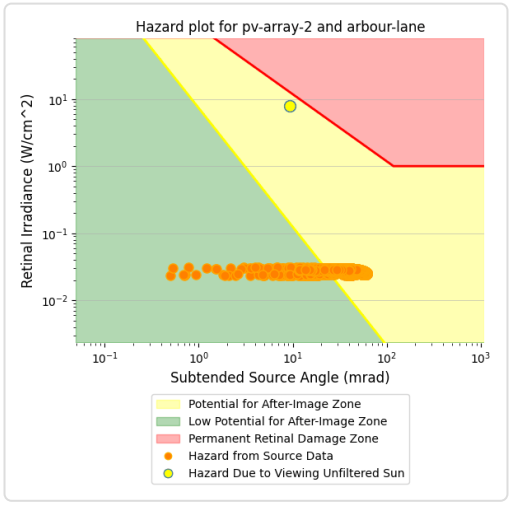
PV array 2 and Route: Arbour lane

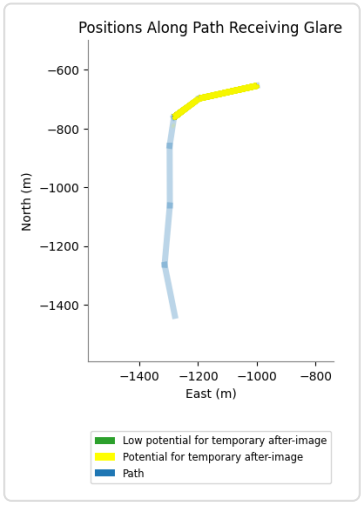
Yellow glare: 1,939 min.

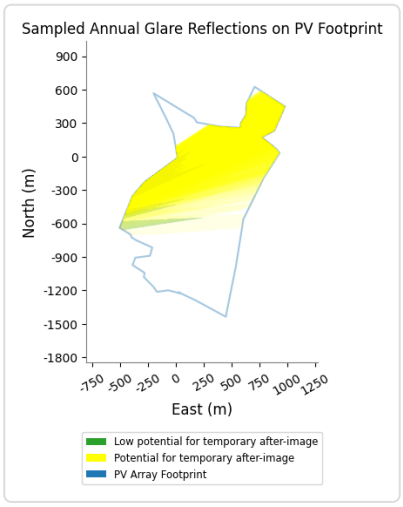
Green glare: 257 min.







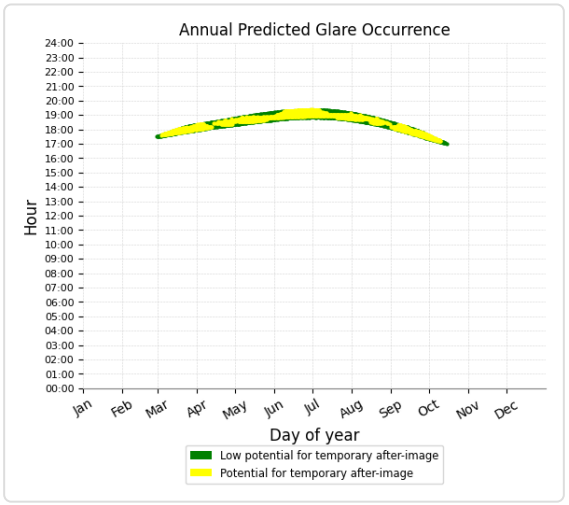


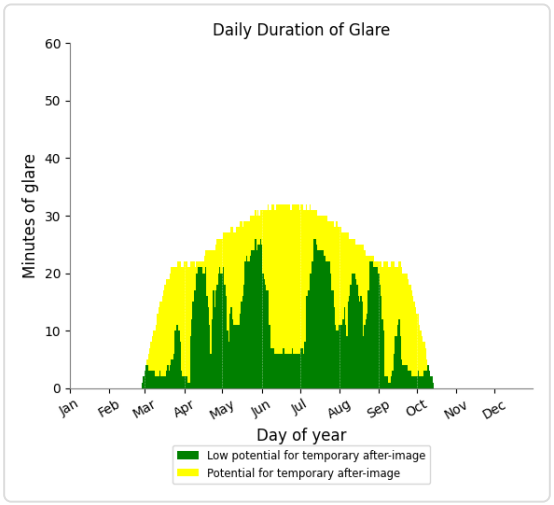


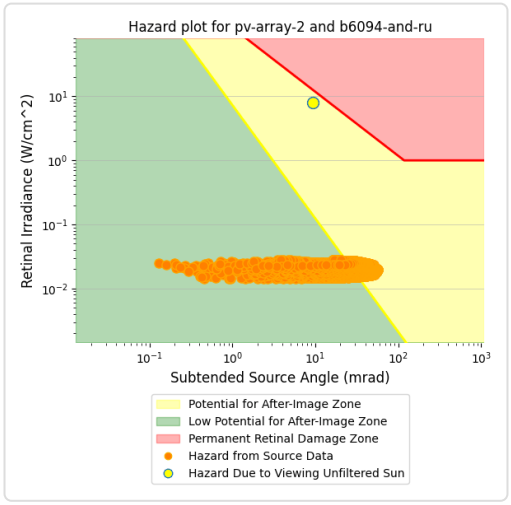
PV array 2 and Route: B6094 and Ruddle Lane

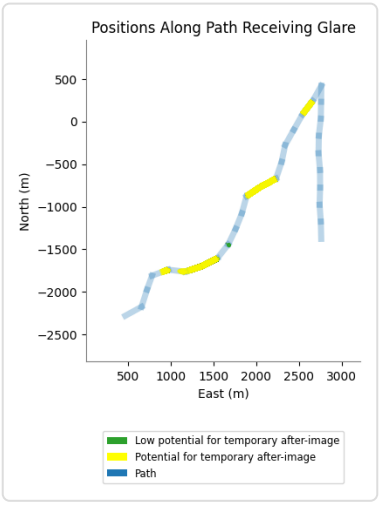
Yellow glare: 2,757 min.

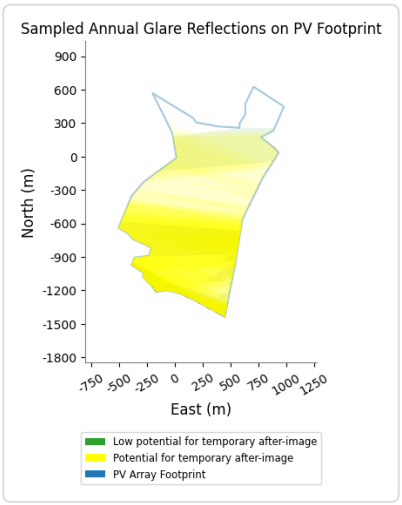
Green glare: 2,660 min.







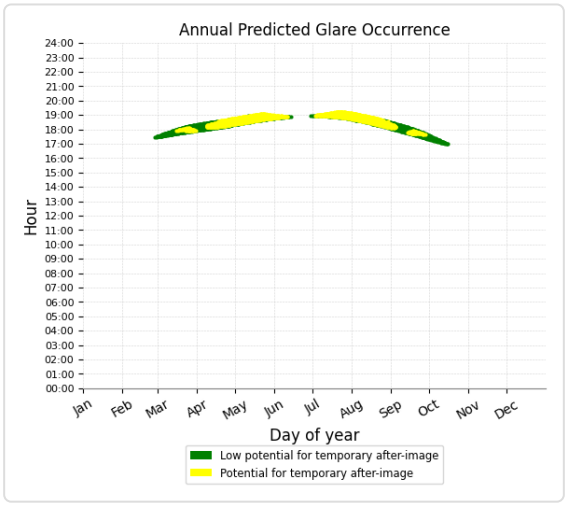


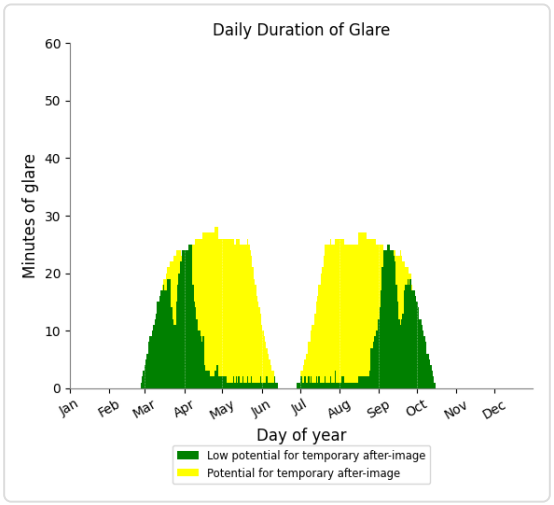


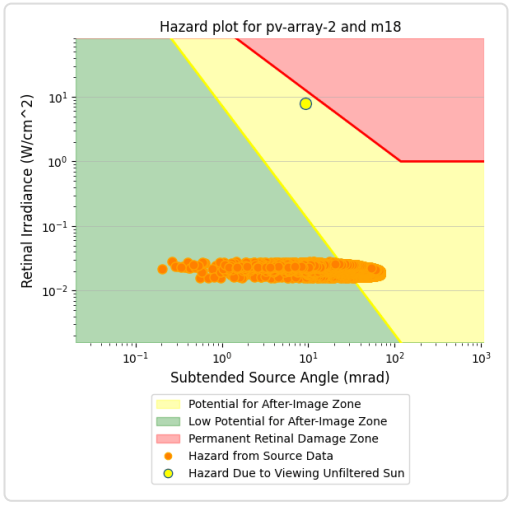
PV array 2 and Route: M18

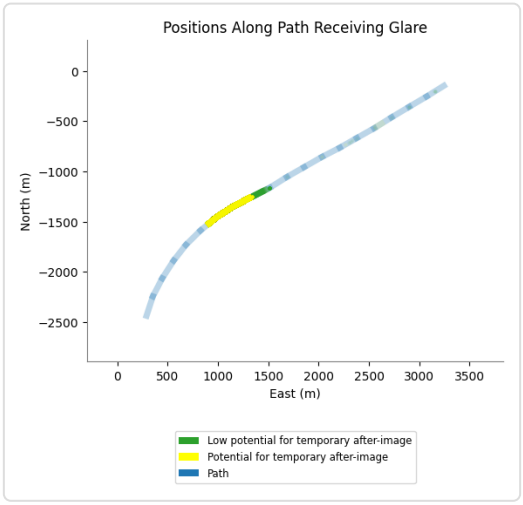
Yellow glare: 2,568 min.

Green glare: 1,632 min.











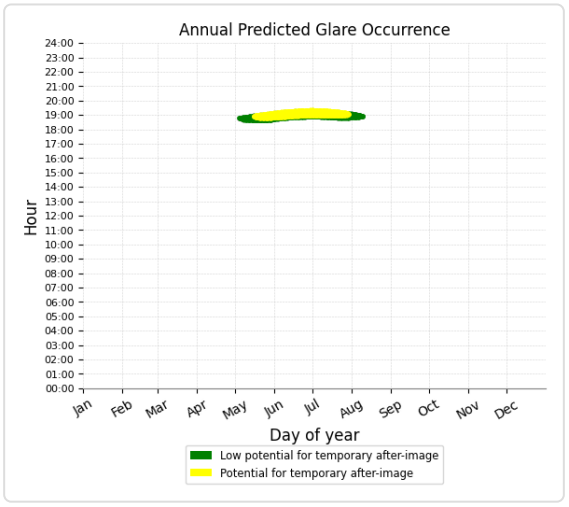
PV array 2 and Route: B6093

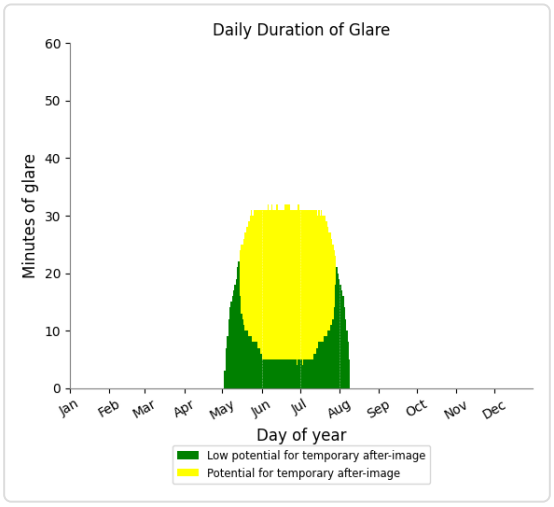
No glare found

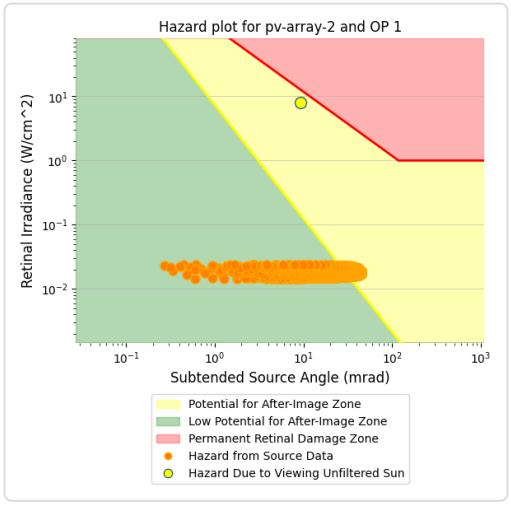
PV array 2 and OP 1

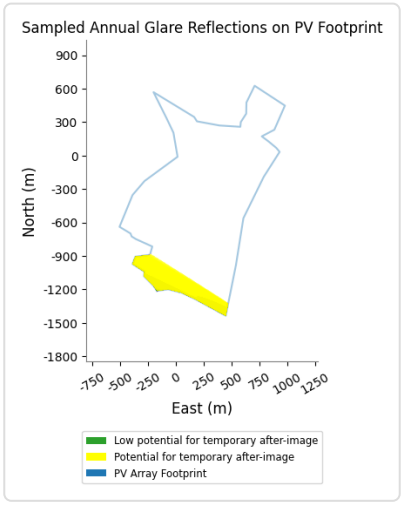
Yellow glare: 1,747 min.

Green glare: 869 min.





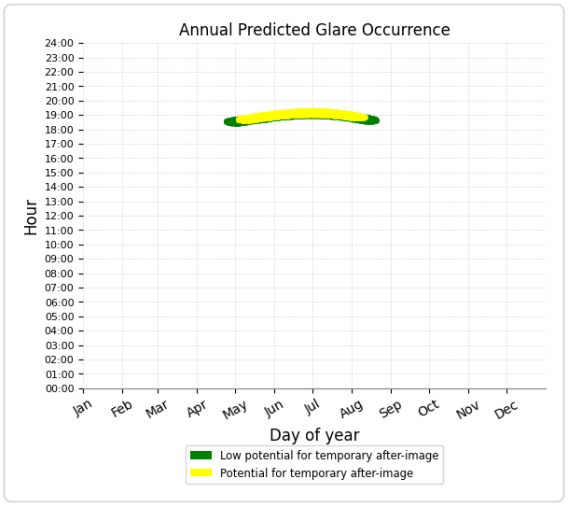


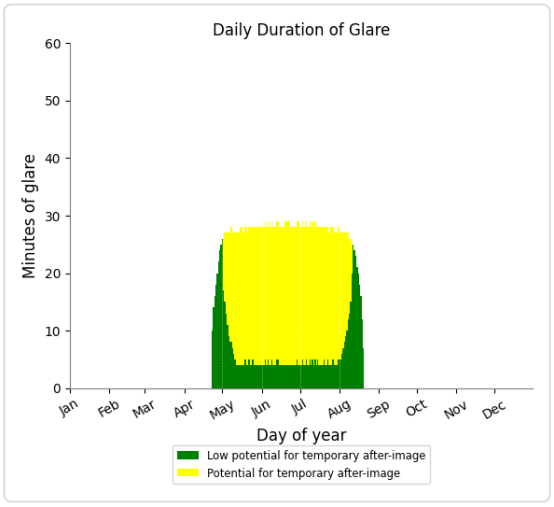


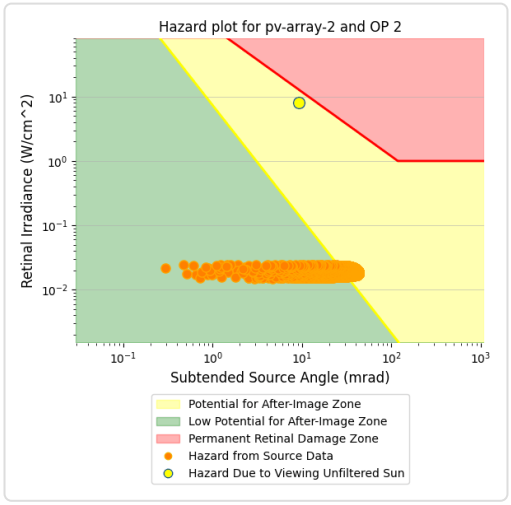
PV array 2 and OP 2

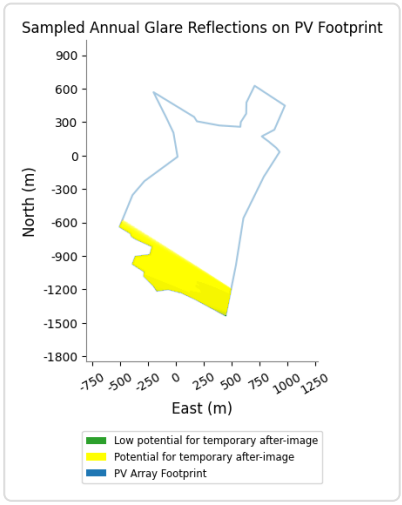
Yellow glare: 2,287 min.

Green glare: 893 min.





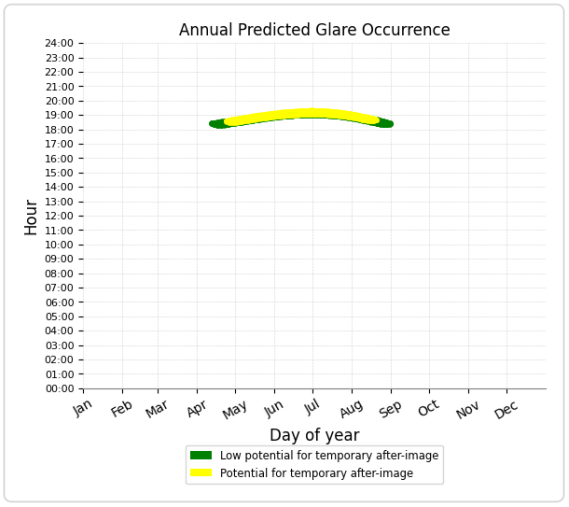


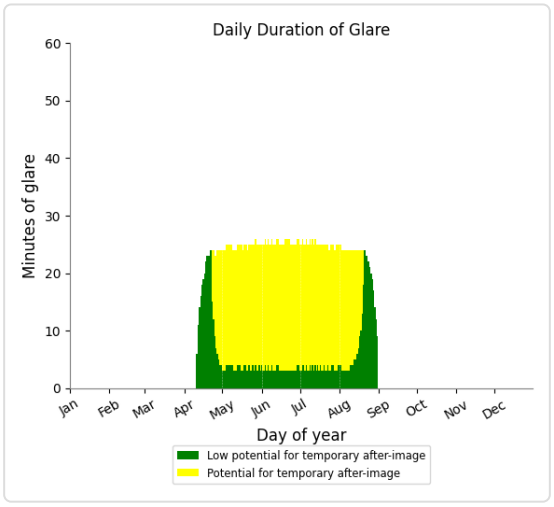


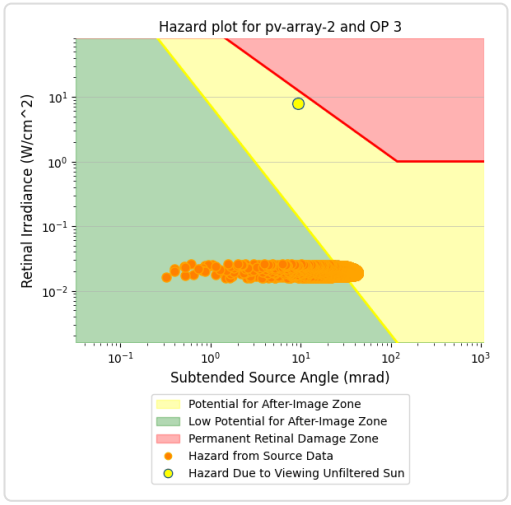
PV array 2 and OP 3

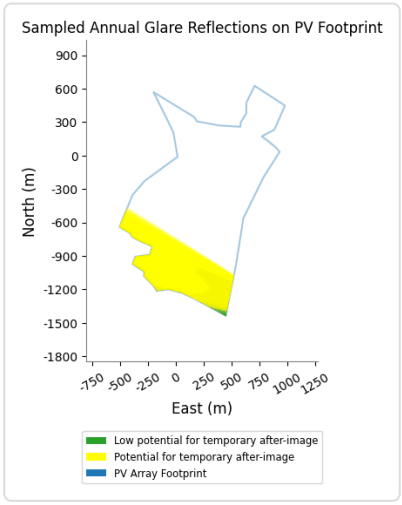
Yellow glare: 2,490 min.

Green glare: 911 min.





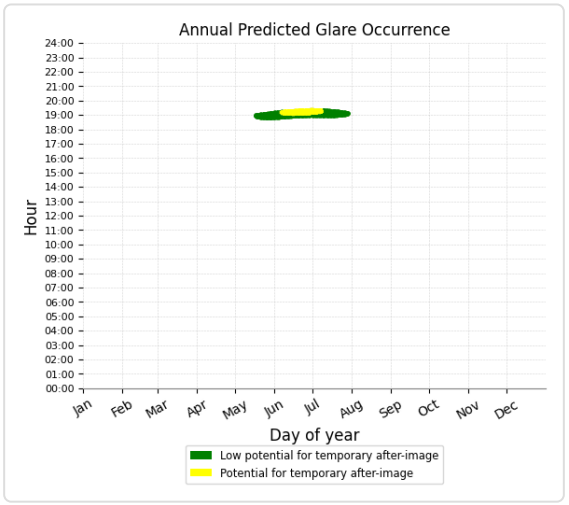


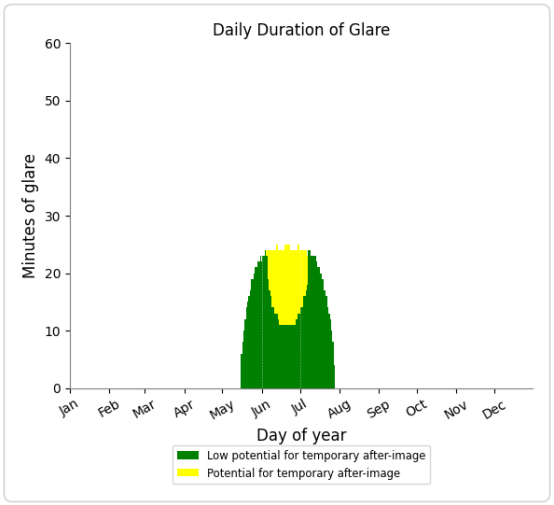


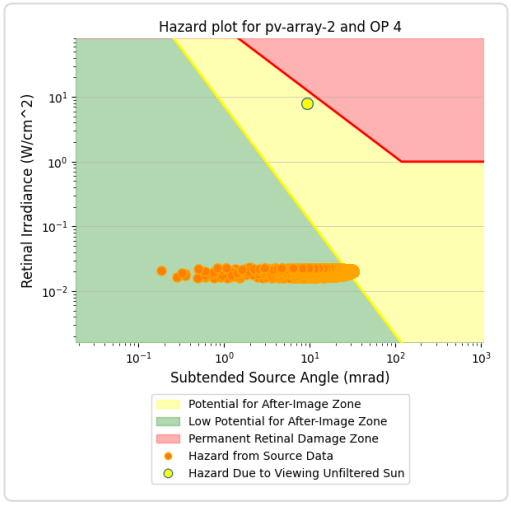
PV array 2 and OP 4

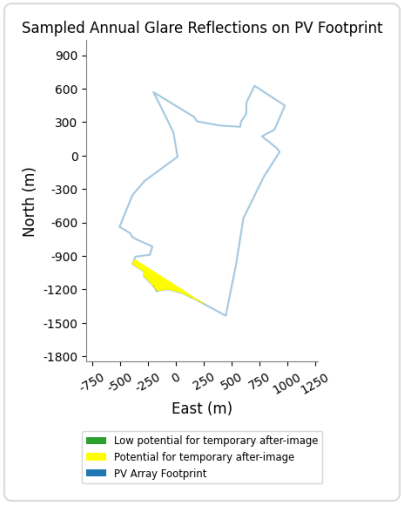
Yellow glare: 356 min.

Green glare: 1,173 min.





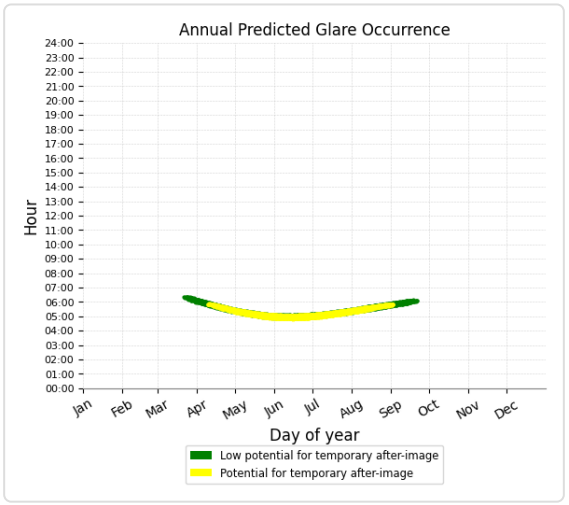


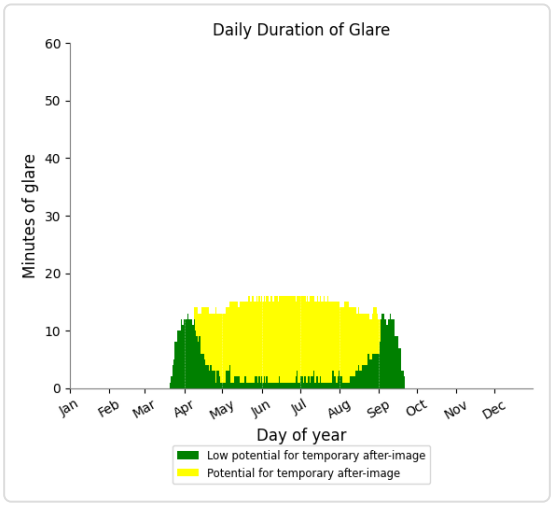


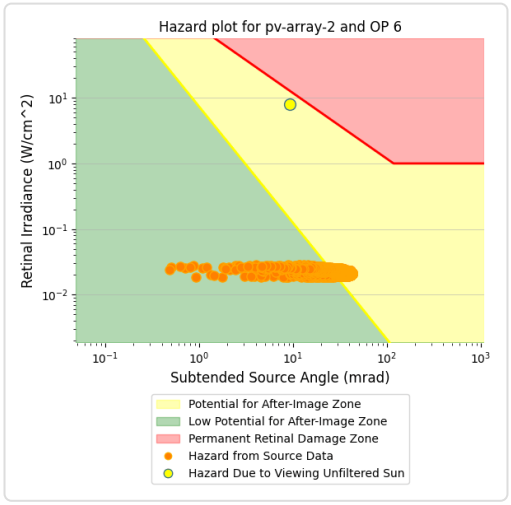
PV array 2 and OP 6

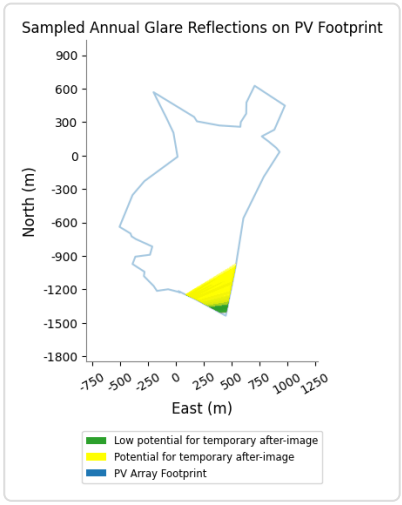
Yellow glare: 1,798 min.

Green glare: 717 min.





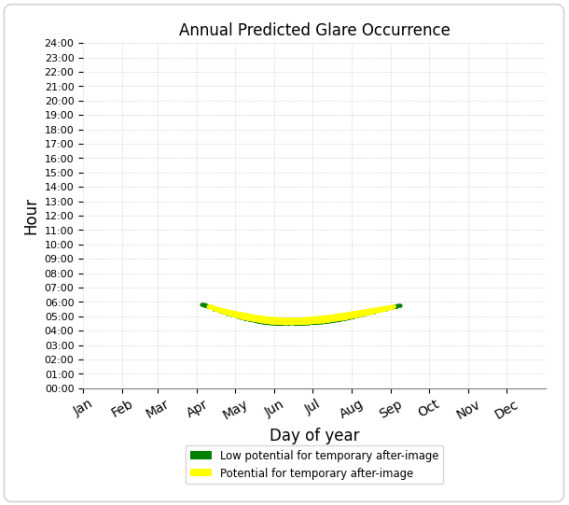


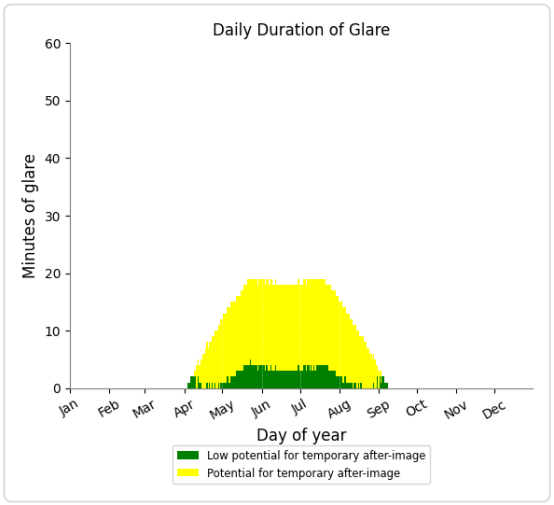


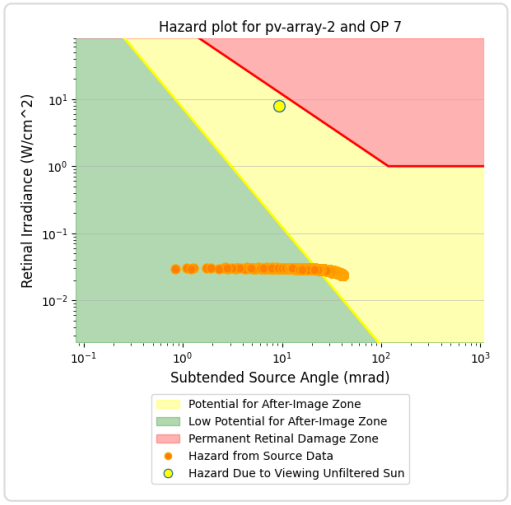
PV array 2 and OP 7

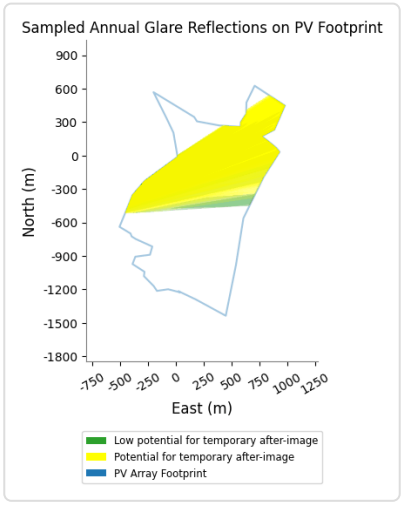
Yellow glare: 1,770 min.

Green glare: 349 min.





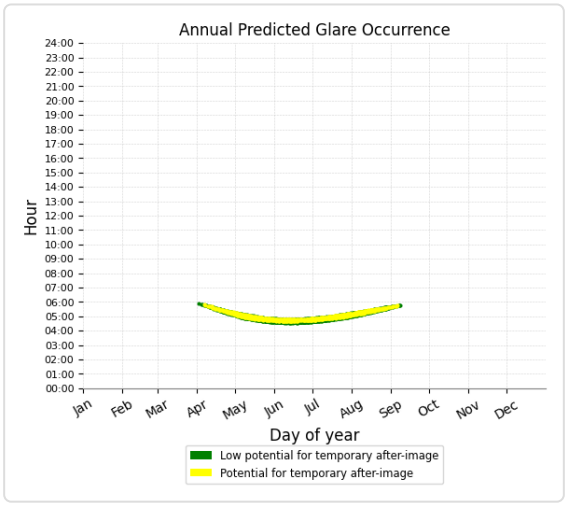


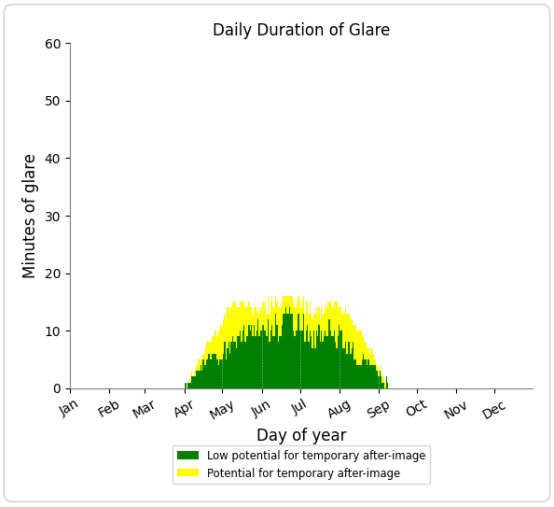


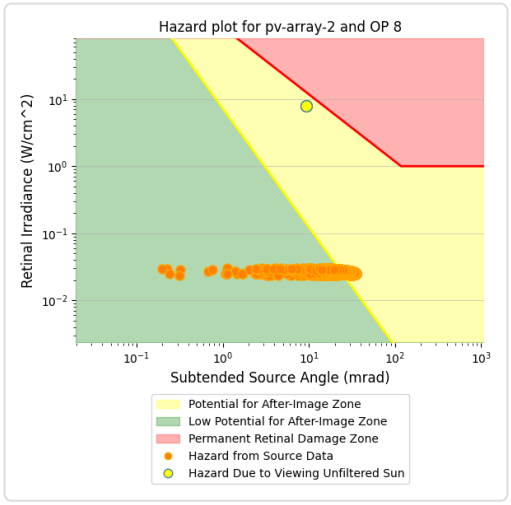
PV array 2 and OP 8

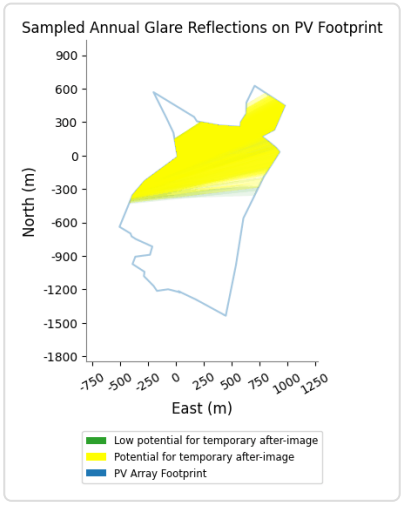
Yellow glare: 620 min.

Green glare: 1,184 min.





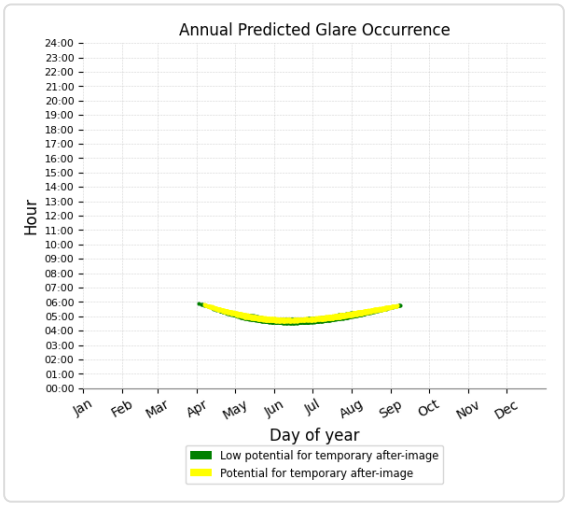


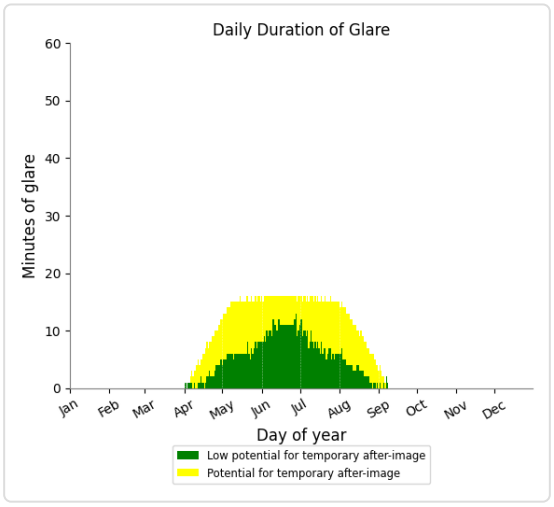


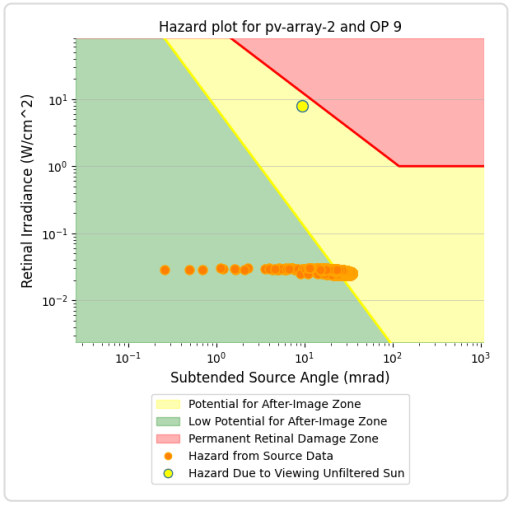
PV array 2 and OP 9

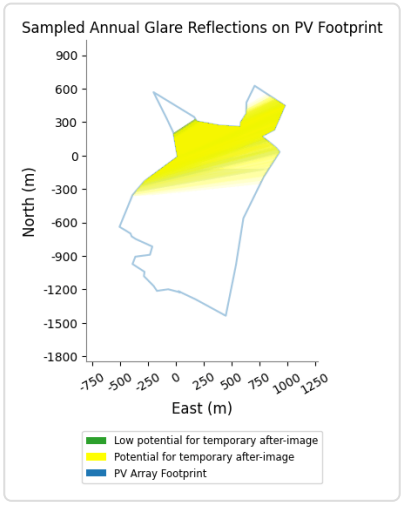
Yellow glare: 1,020 min.

Green glare: 891 min.





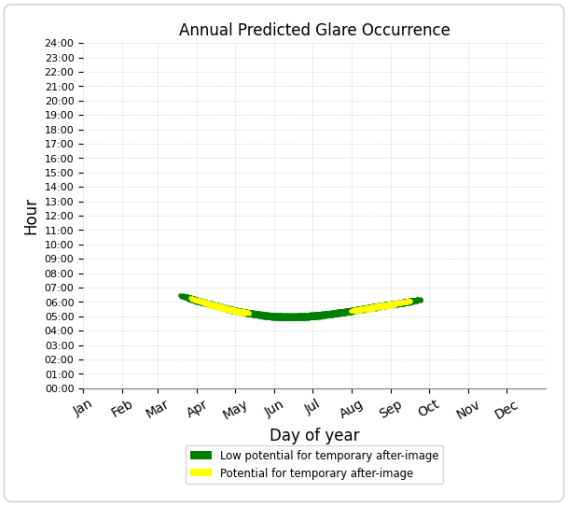


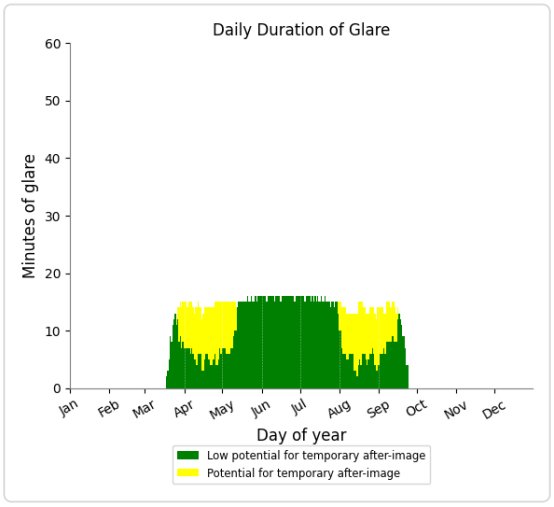


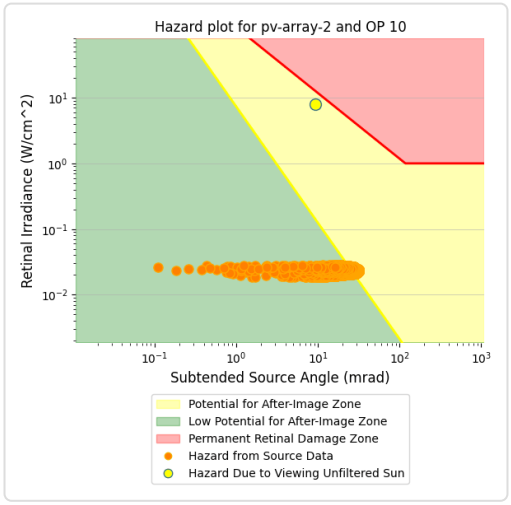
PV array 2 and OP 10

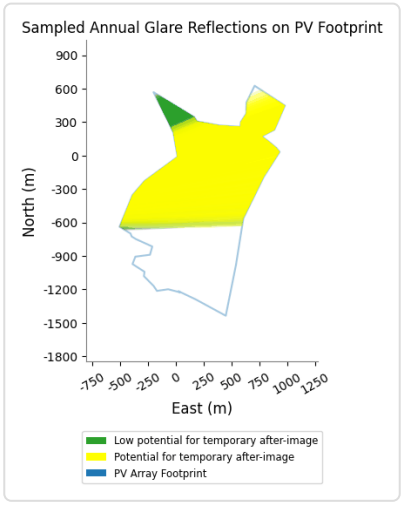
Yellow glare: 750 min.

Green glare: 1,966 min.





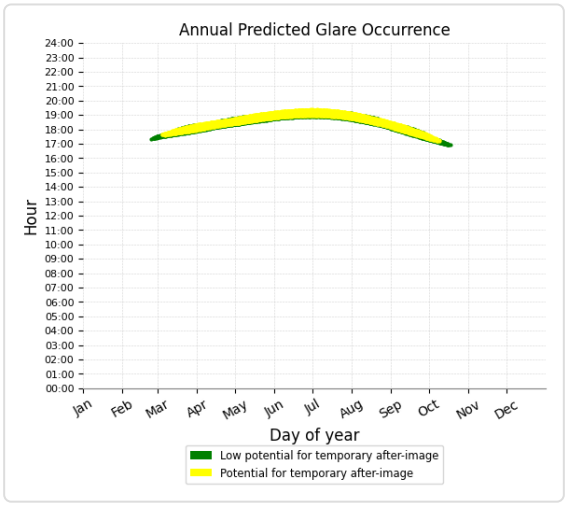


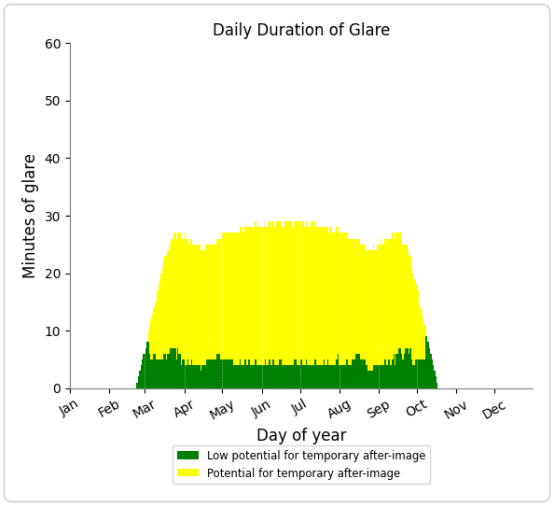


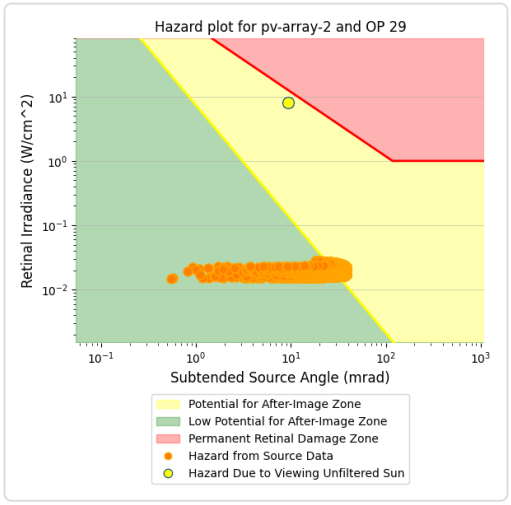
PV array 2 and OP 29

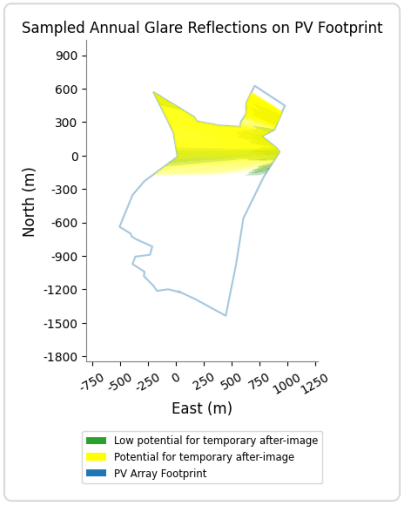
Yellow glare: 4,546 min.

Green glare: 1,119 min.





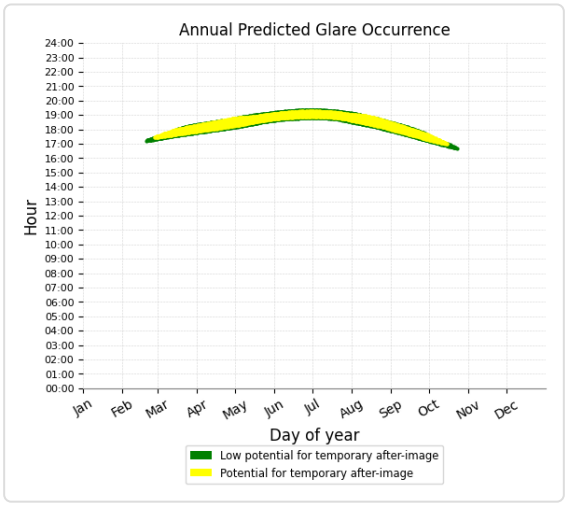


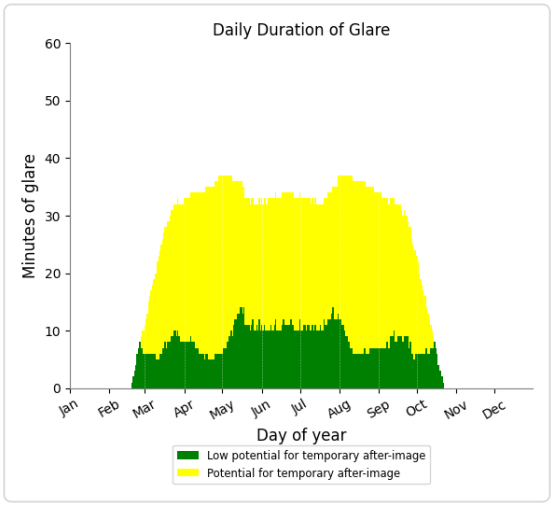


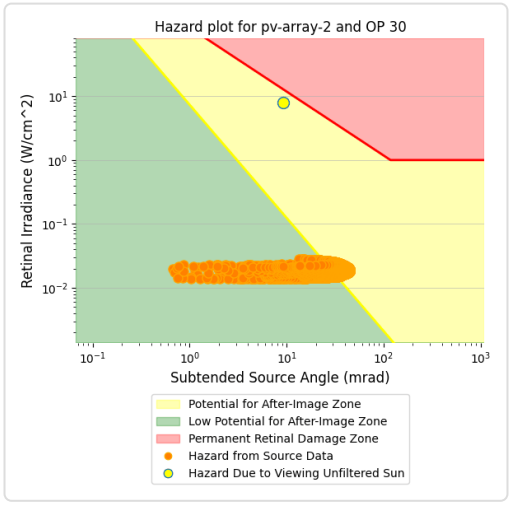
PV array 2 and OP 30

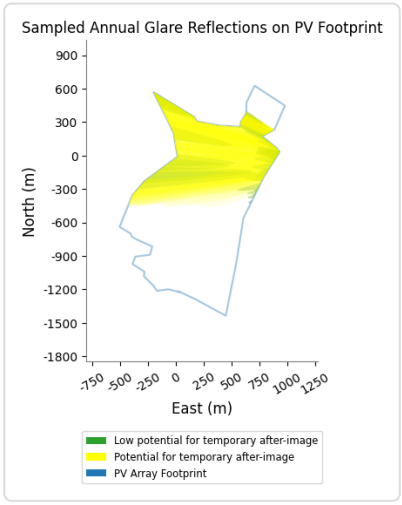
Yellow glare: 5,218 min.

Green glare: 2,053 min.





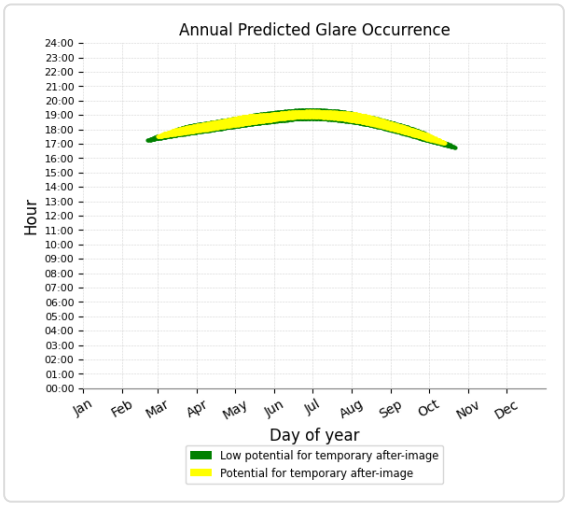


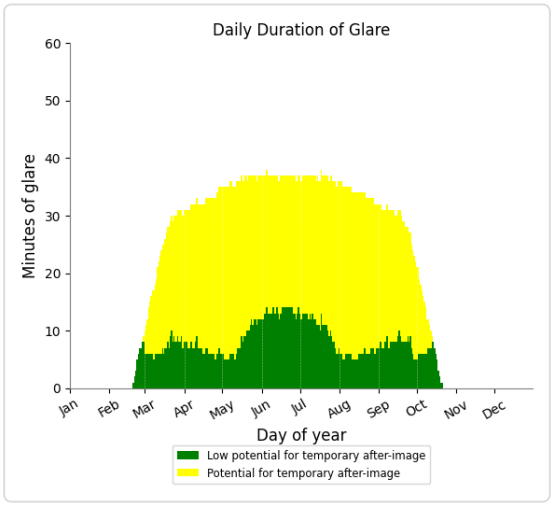


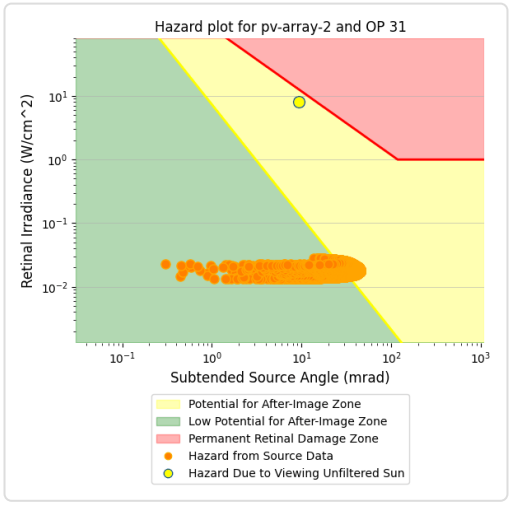
PV array 2 and OP 31

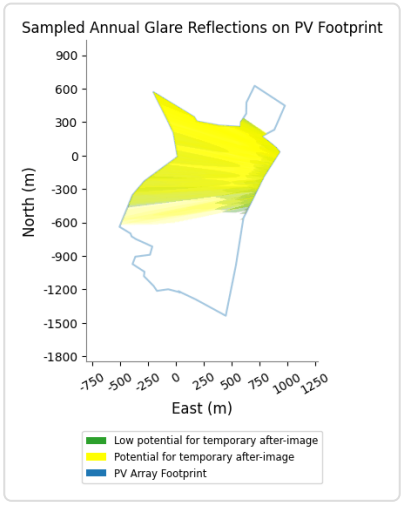
Yellow glare: 5,280 min.

Green glare: 2,000 min.





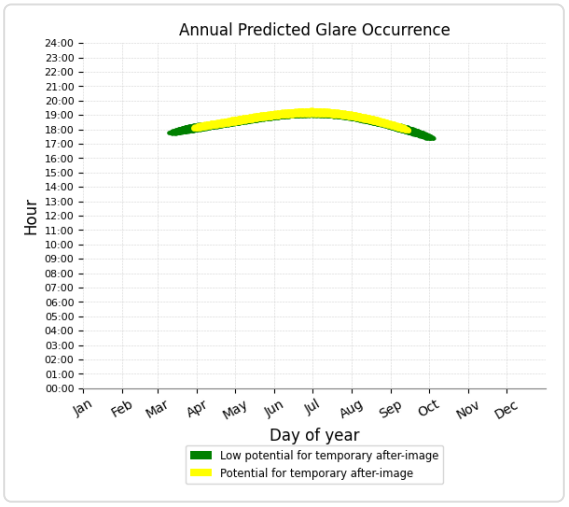


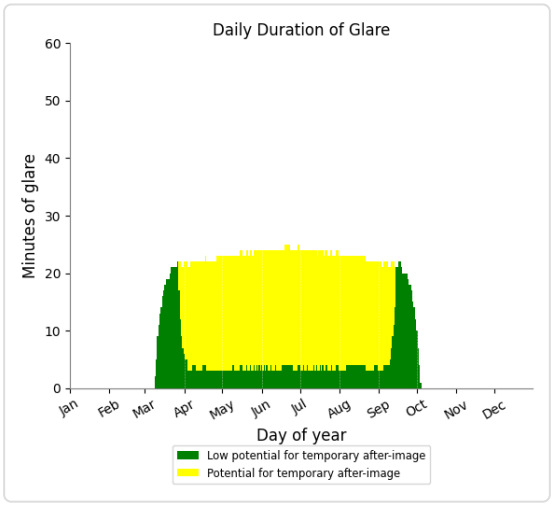


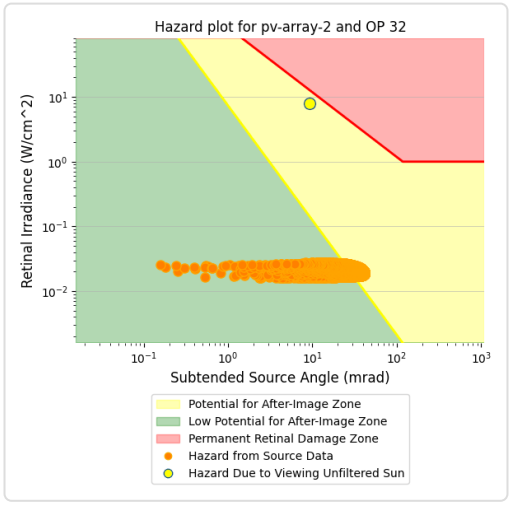
PV array 2 and OP 32

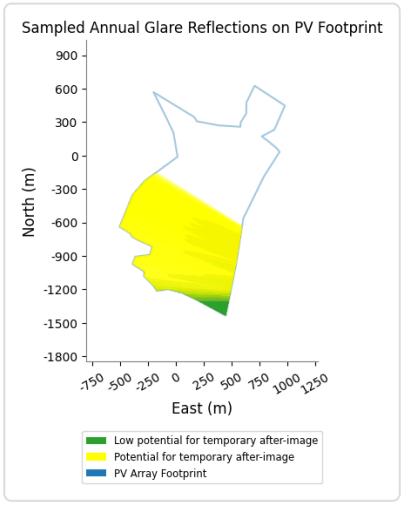
Yellow glare: 3,296 min.

Green glare: 1,279 min.





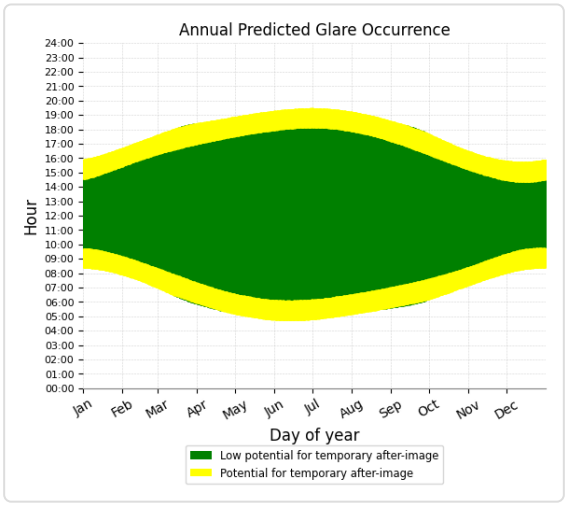


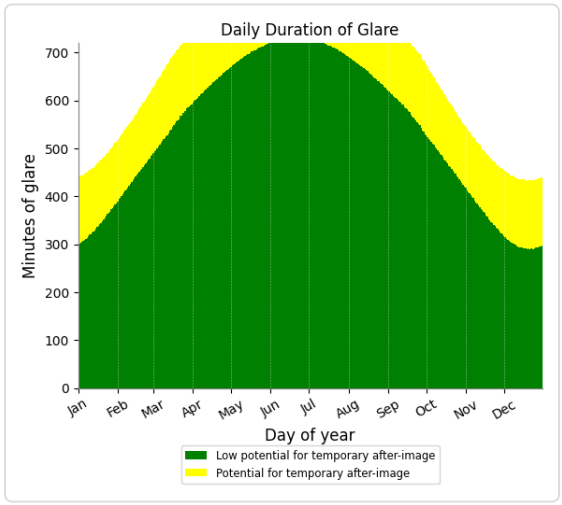


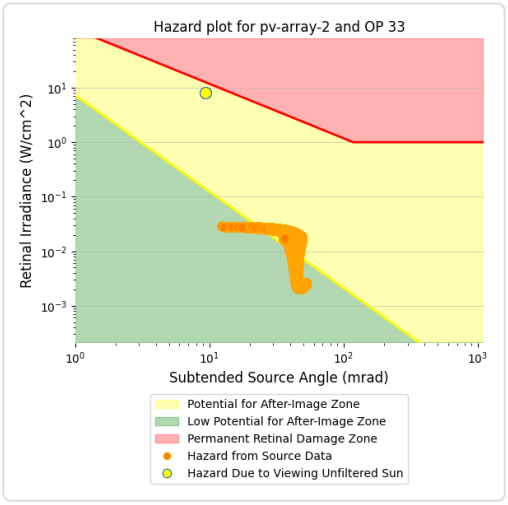
PV array 2 and OP 33

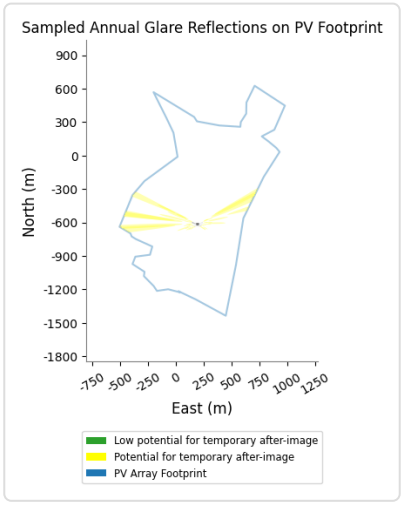
Yellow glare: 50,612 min.

Green glare: 197,012 min.





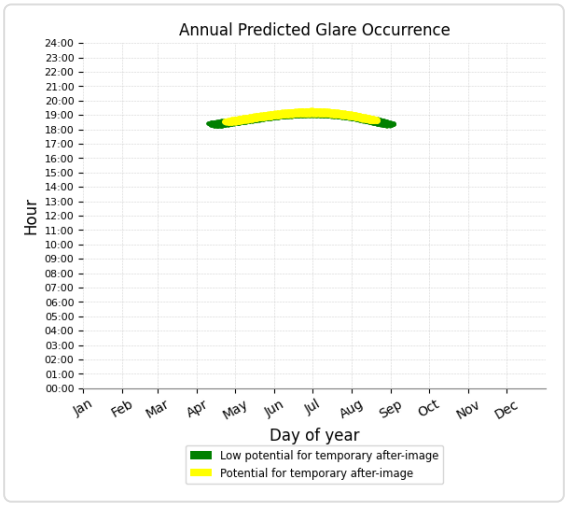


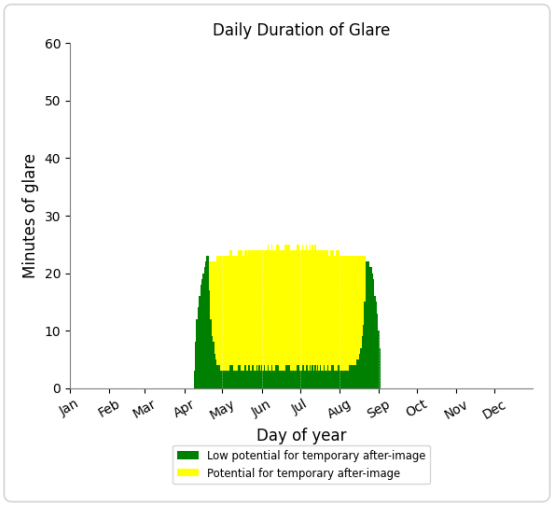


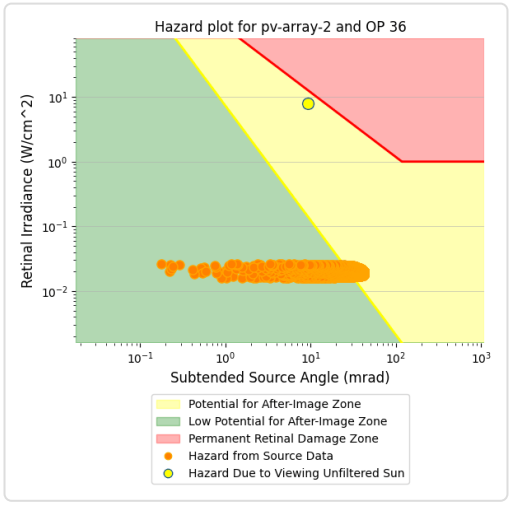
PV array 2 and OP 36

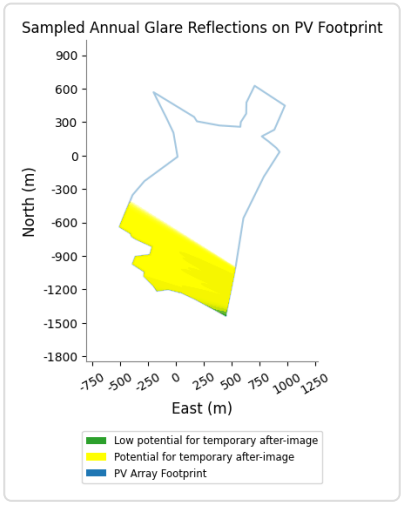
Yellow glare: 2,423 min.

Green glare: 899 min.





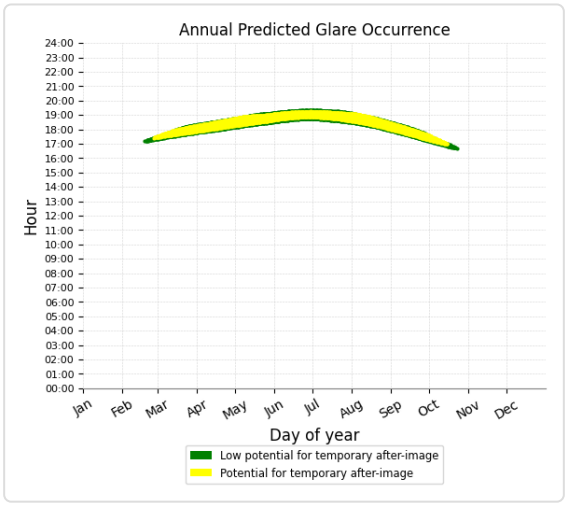


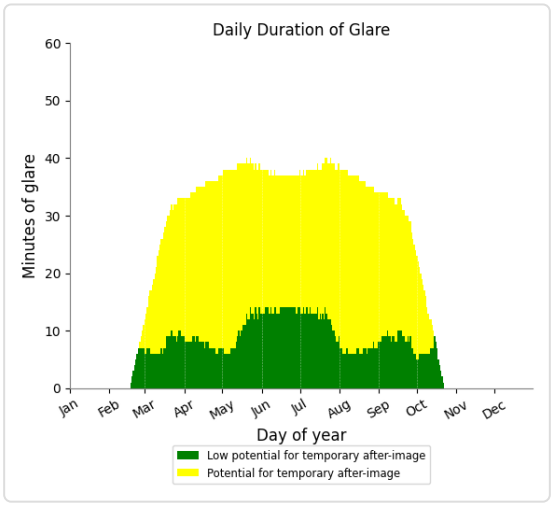


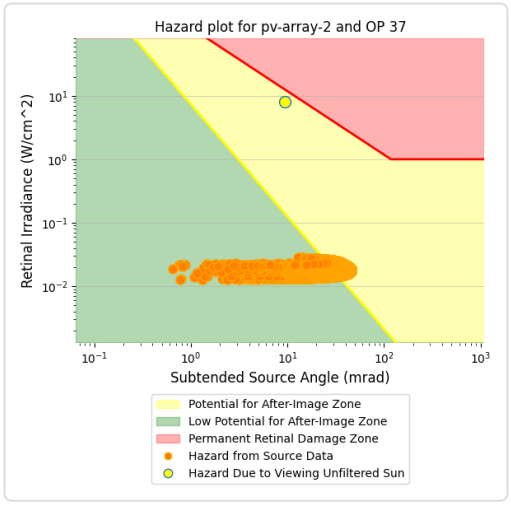
PV array 2 and OP 37

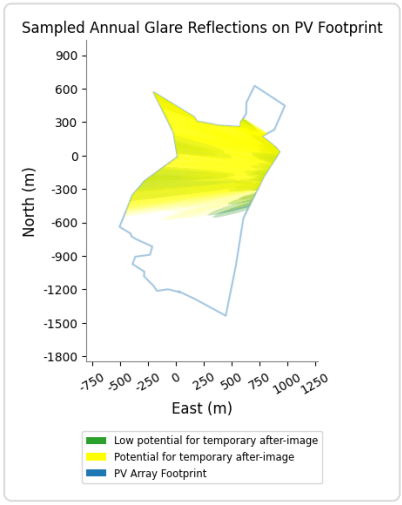
Yellow glare: 5,540 min.

Green glare: 2,207 min.





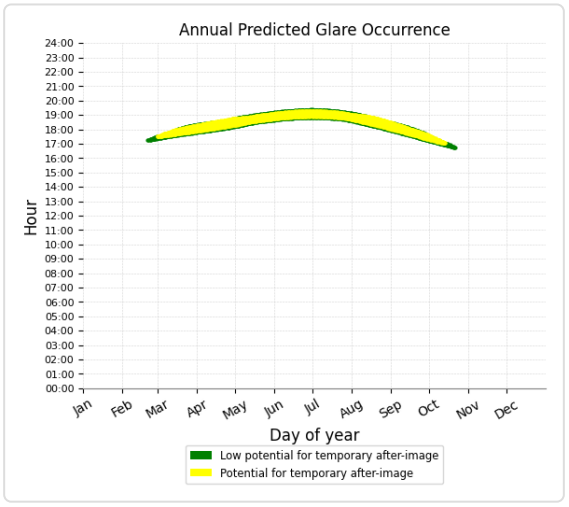


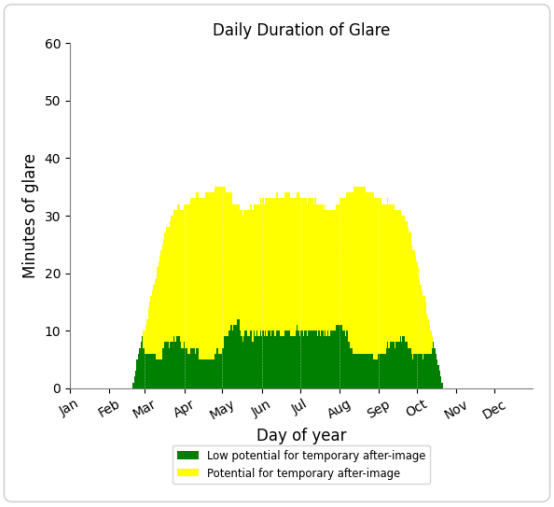


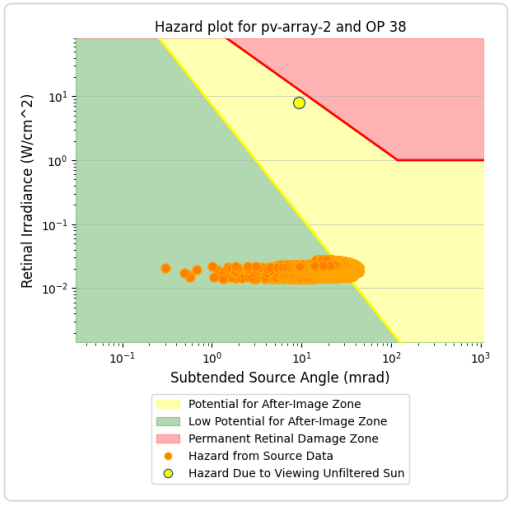
PV array 2 and OP 38

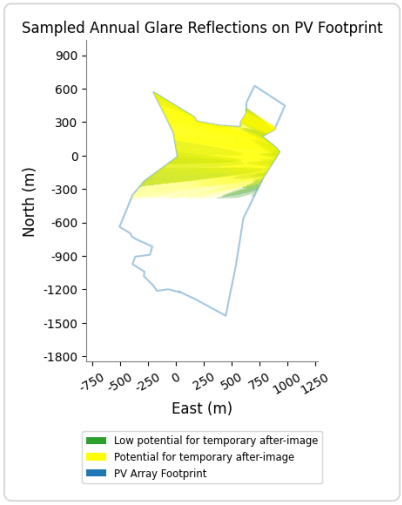
Yellow glare: 5,101 min.

Green glare: 1,879 min.





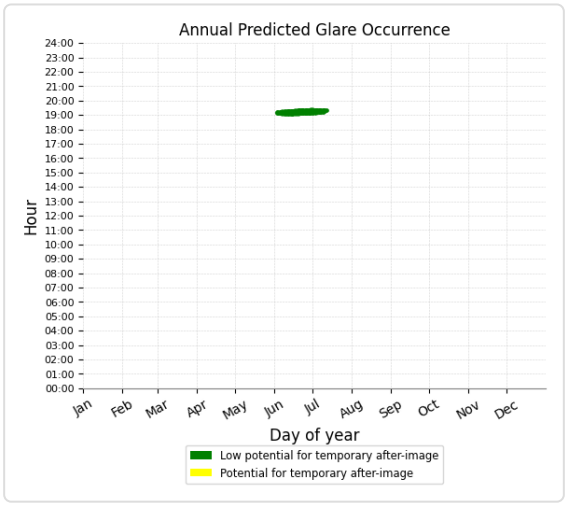


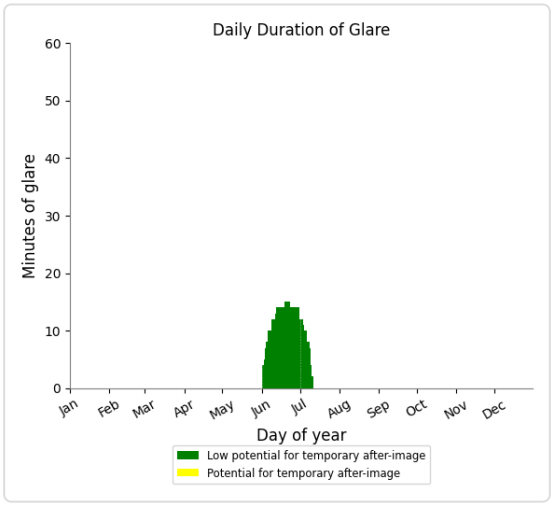


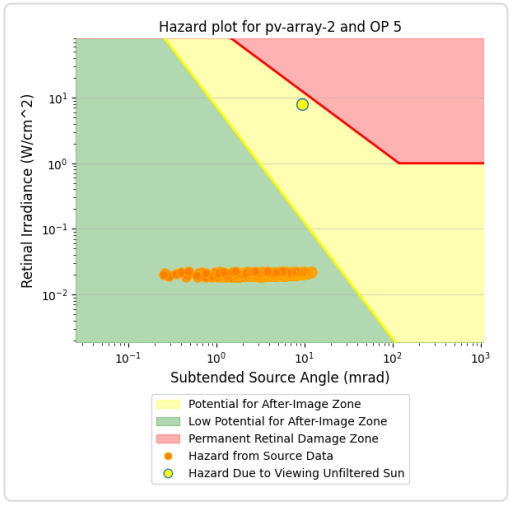
PV array 2 and OP 5

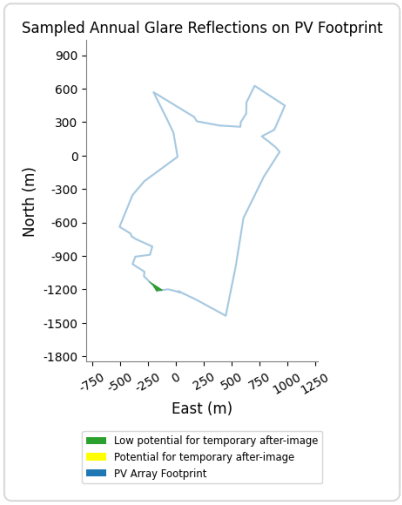
Yellow glare: none

Green glare: 456 min.





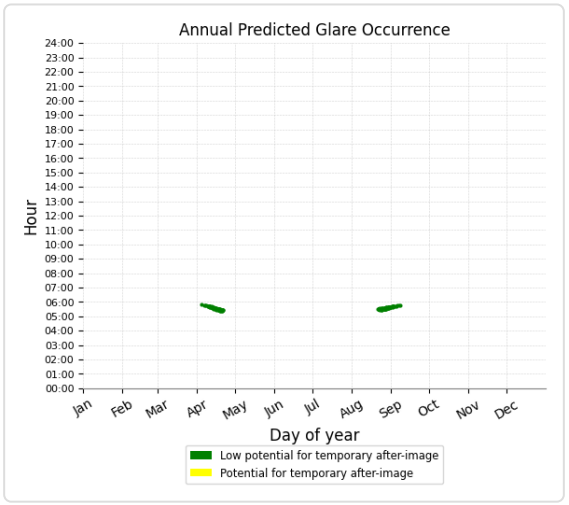


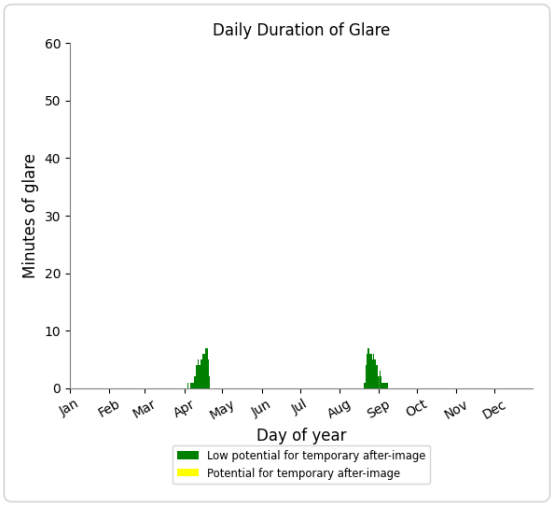


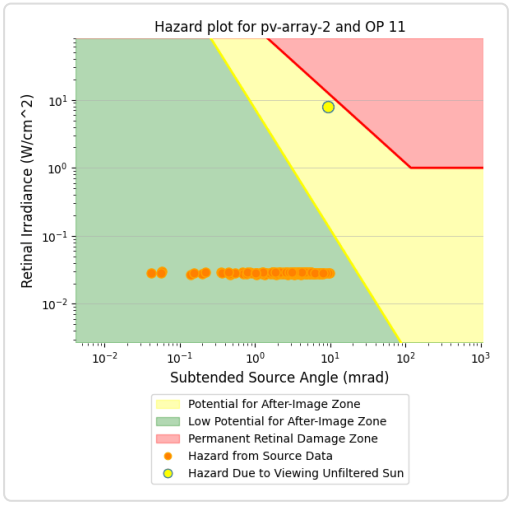
PV array 2 and OP 11

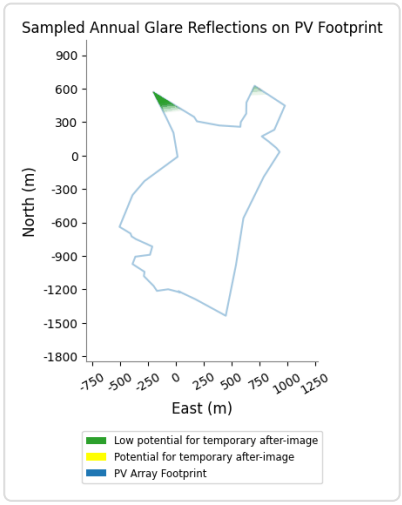
Yellow glare: none

Green glare: 130 min.





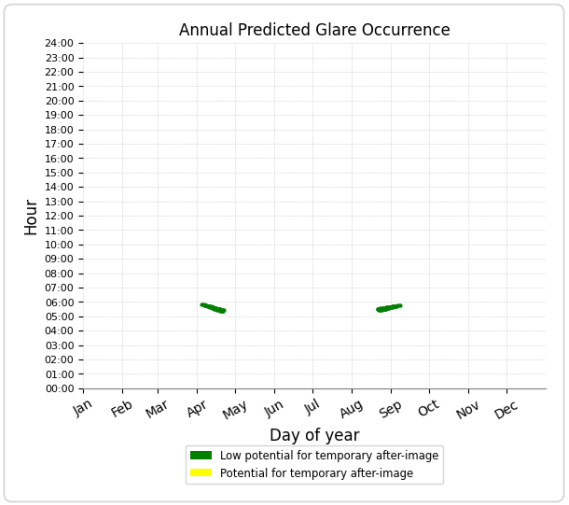


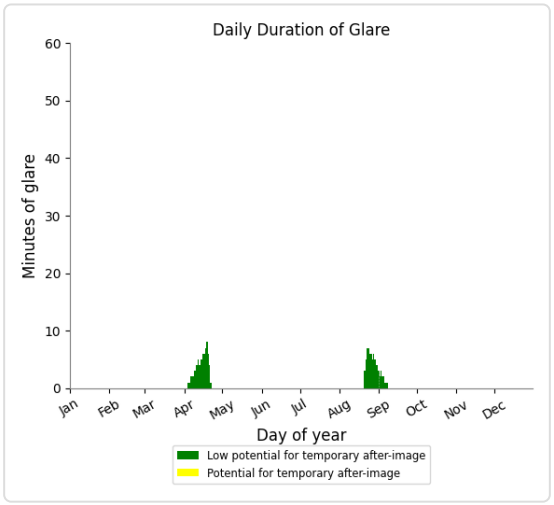


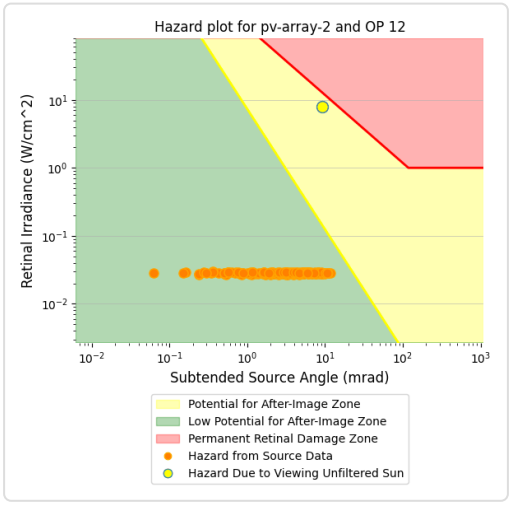
PV array 2 and OP 12

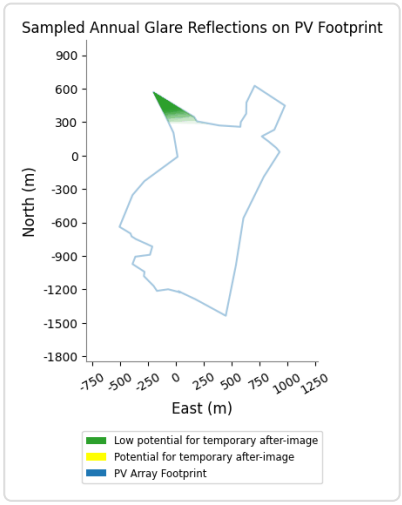
Yellow glare: none

Green glare: 148 min.





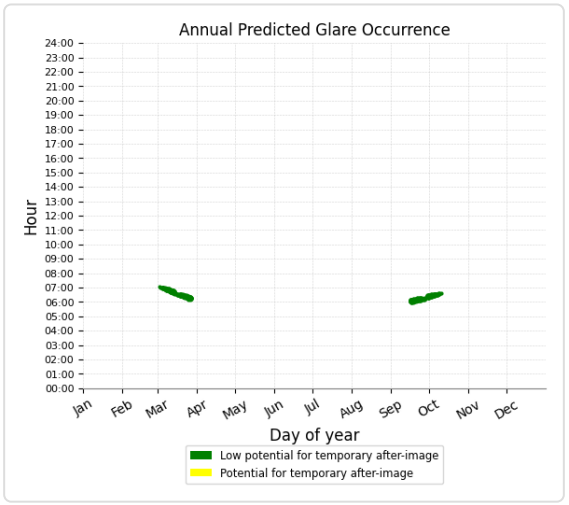


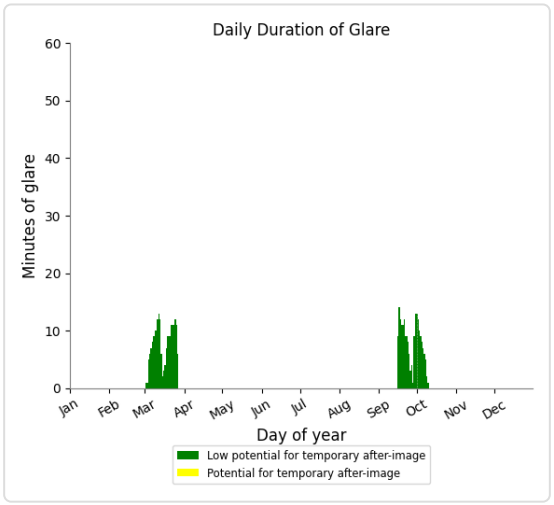


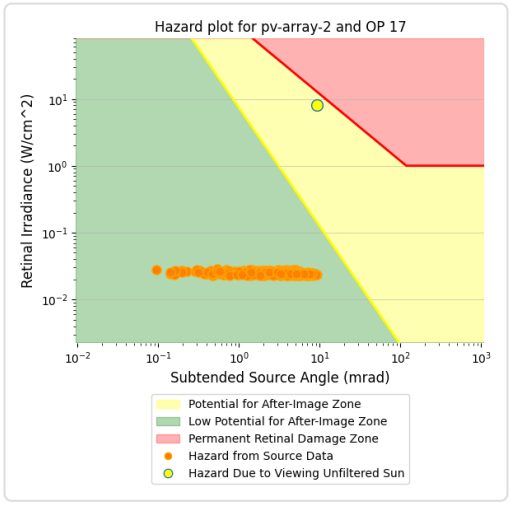
PV array 2 and OP 17

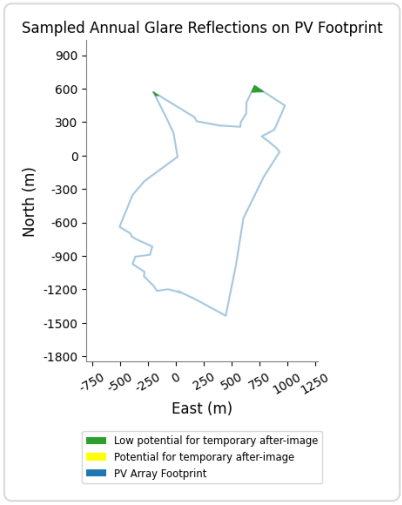
Yellow glare: none

Green glare: 409 min.





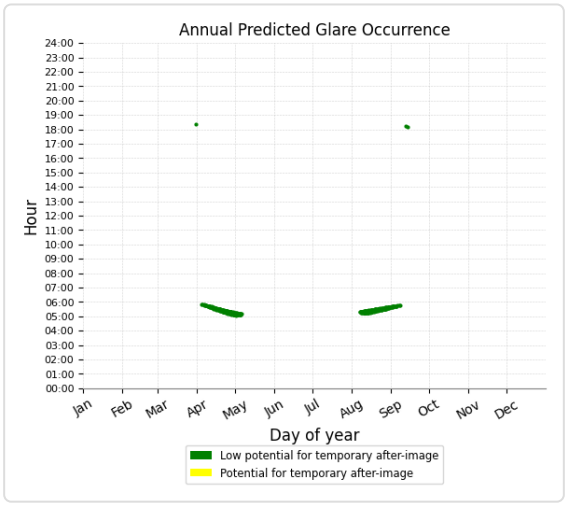


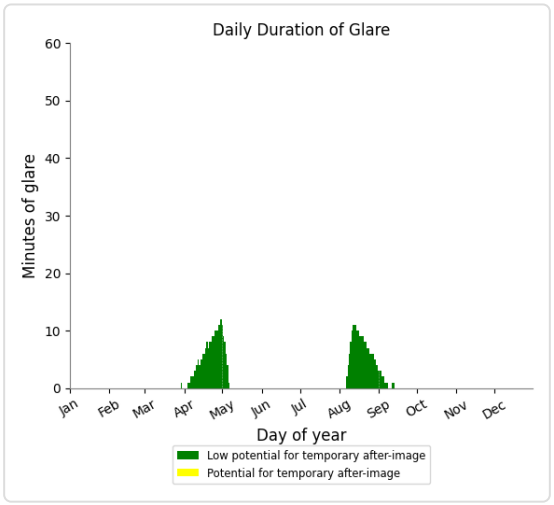


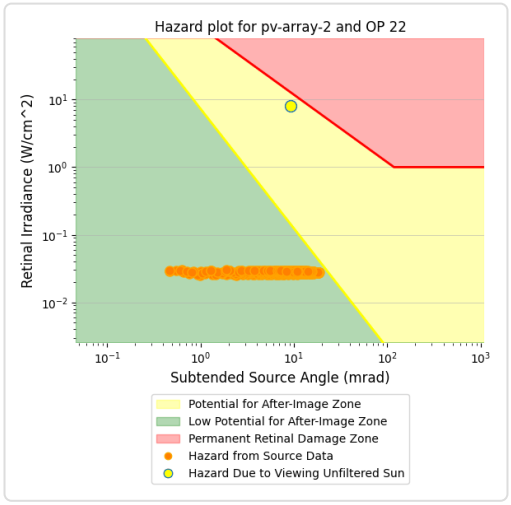
PV array 2 and OP 22

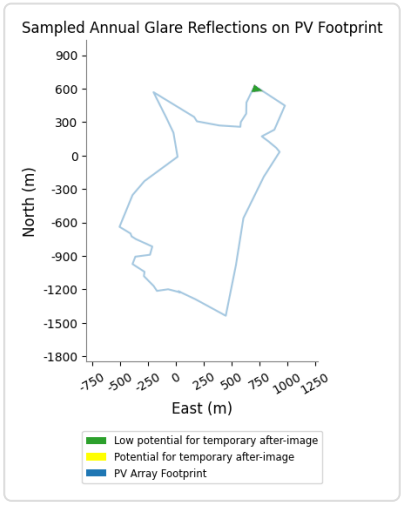
Yellow glare: none

Green glare: 413 min.





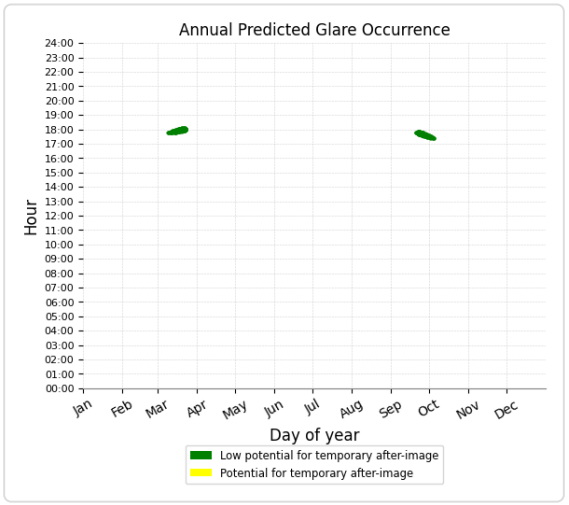


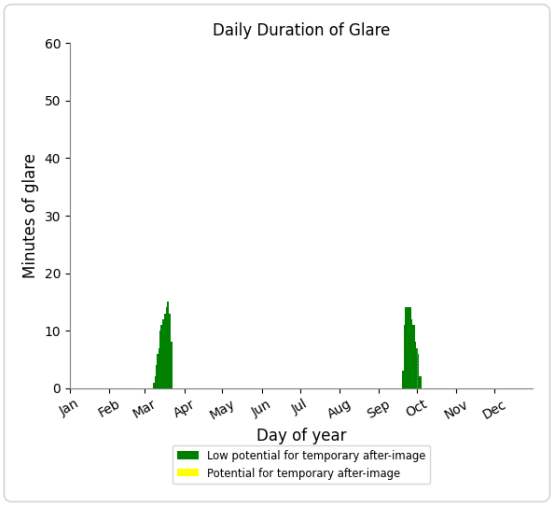


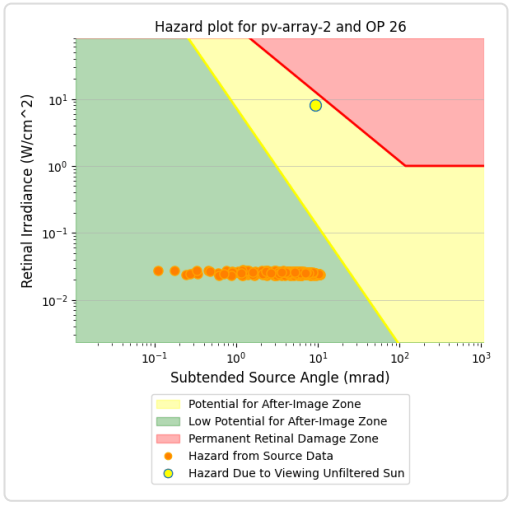
PV array 2 and OP 26

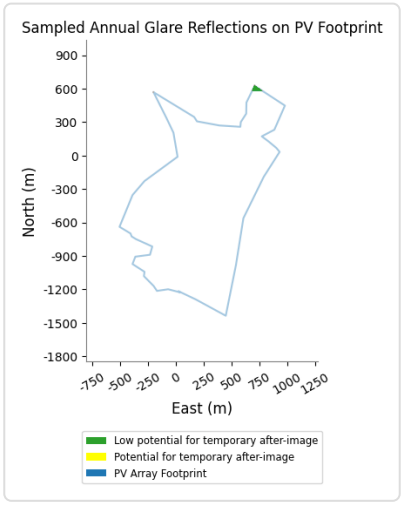
Yellow glare: none

Green glare: 284 min.



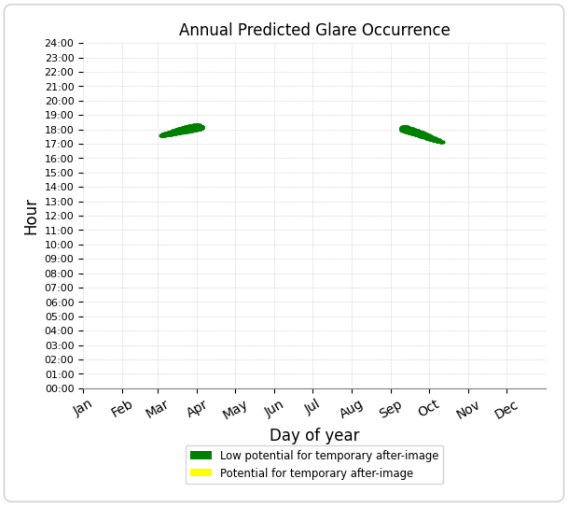


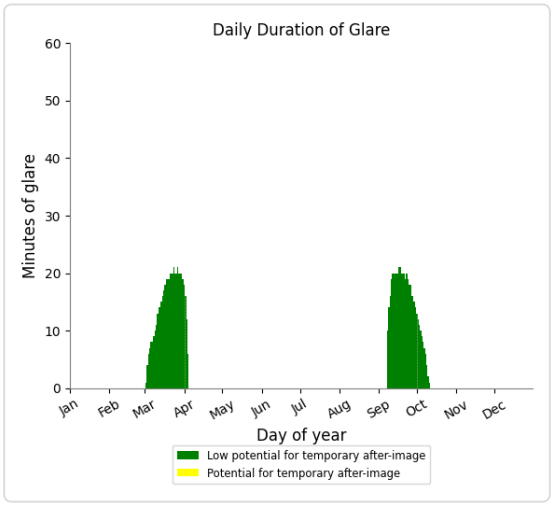


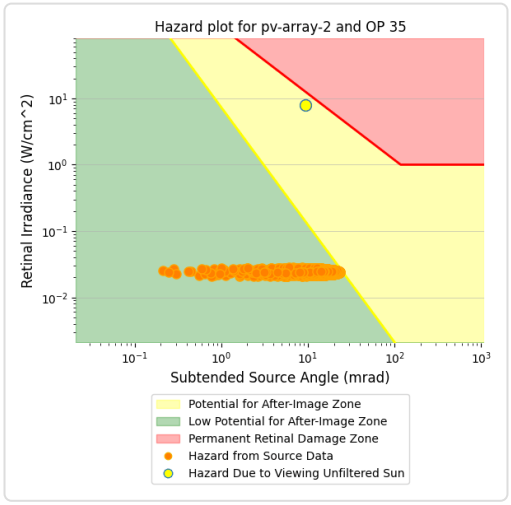


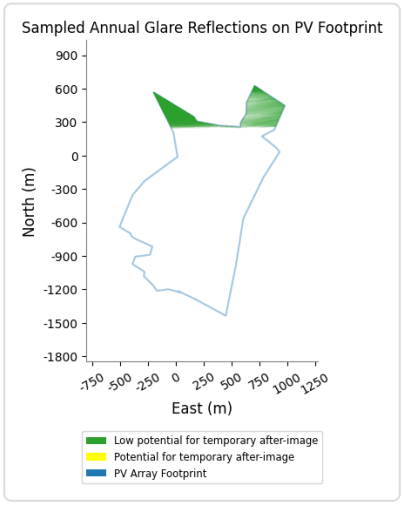
PV array 2 and OP 35

Yellow glare: none
Green glare: 1,000 min.









PV array 2 and OP 13

No glare found

PV array 2 and OP 14

No glare found

PV array 2 and OP 15

No glare found

PV array 2 and OP 16

No glare found

PV array 2 and OP 18

No glare found

PV array 2 and OP 19

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 21

No glare found

PV array 2 and OP 23

No glare found

PV array 2 and OP 24

No glare found

PV array 2 and OP 25

No glare found

PV array 2 and OP 27

No glare found

PV array 2 and OP 28

No glare found

PV array 2 and OP 34

No glare found

PV: PV array 3 potential temporary after-image

Receptor results ordered by category of glare

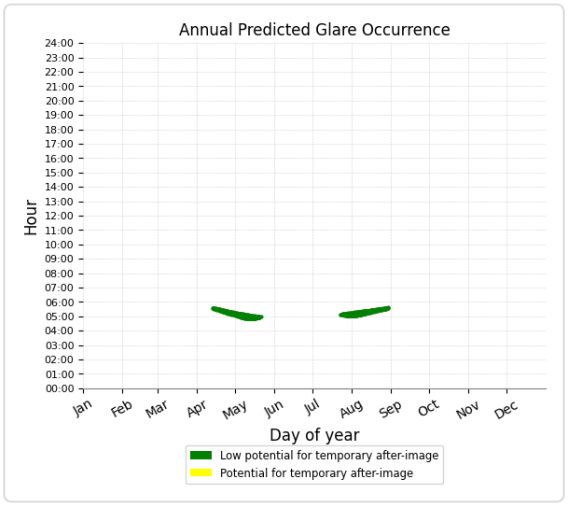
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	757	12.6	0	0.0
B6094 and Ruddle Lane	19	0.3	0	0.0
M18	1,490	24.8	0	0.0
B6093	0	0.0	0	0.0
OP 29	578	9.6	2,390	39.8
OP 30	1,539	25.6	2,774	46.2
OP 31	1,436	23.9	659	11.0
OP 37	1,587	26.4	1,260	21.0
OP 38	1,402	23.4	3,028	50.5
OP 7	749	12.5	0	0.0
OP 8	423	7.0	0	0.0
OP 9	340	5.7	0	0.0
OP 10	462	7.7	0	0.0
OP 33	1,580	26.3	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 32	0	0.0	0	0.0

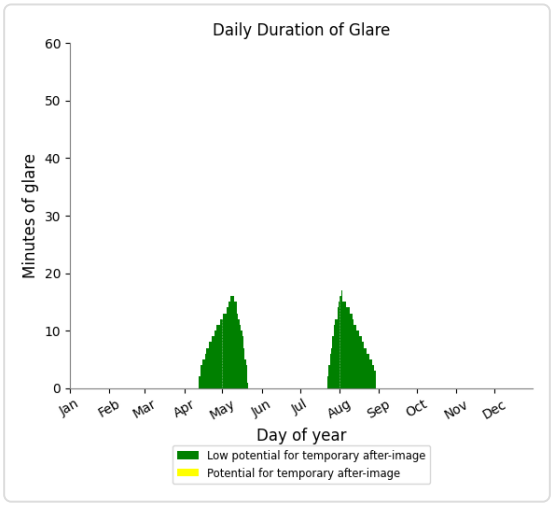
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0

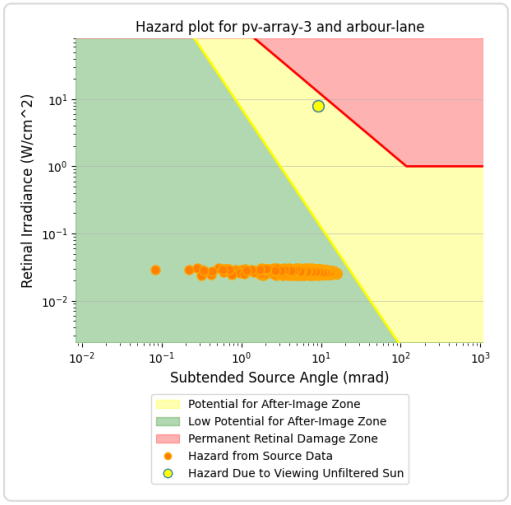
PV array 3 and Route: Arbour lane

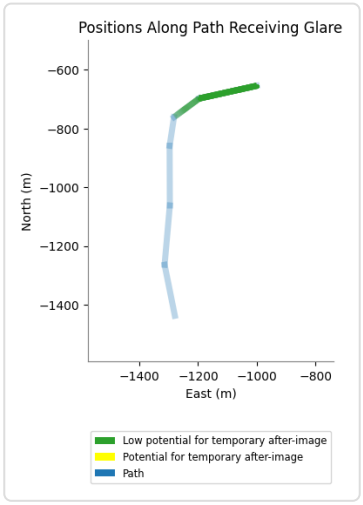
Yellow glare: none

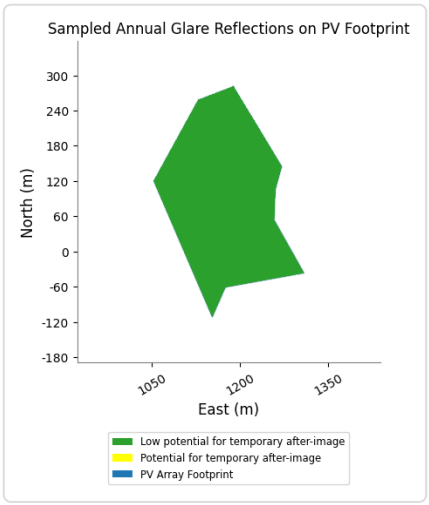
Green glare: 757 min.







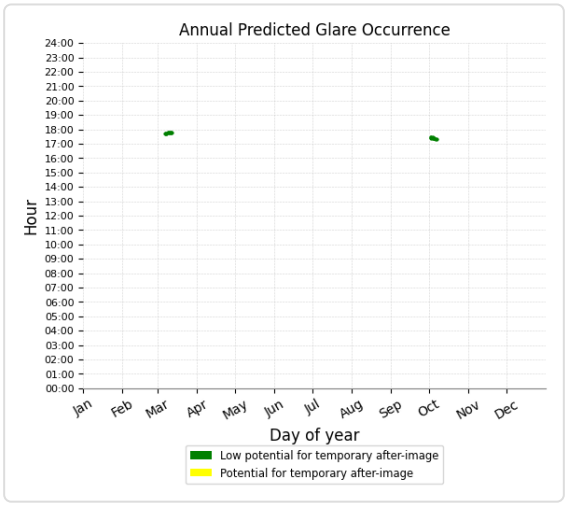


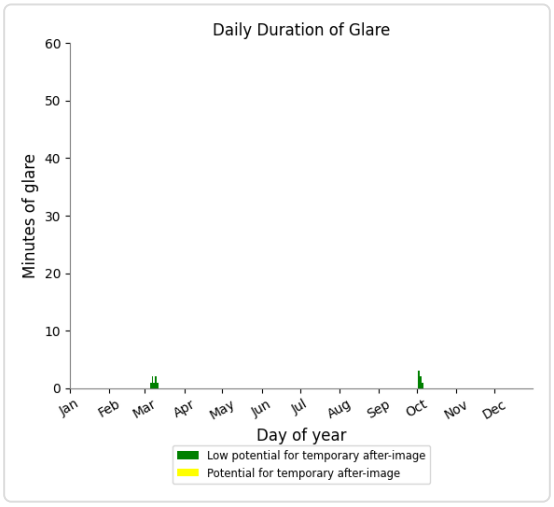


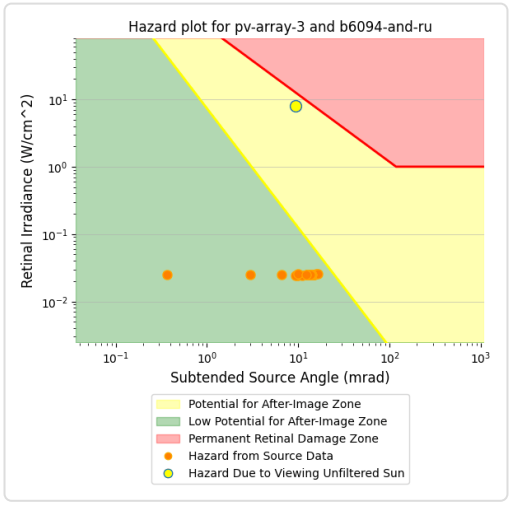
PV array 3 and Route: B6094 and Ruddle Lane

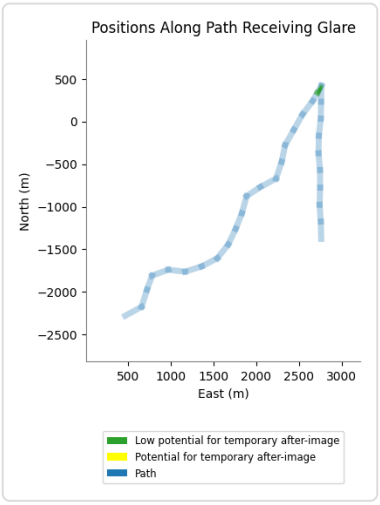
Yellow glare: none

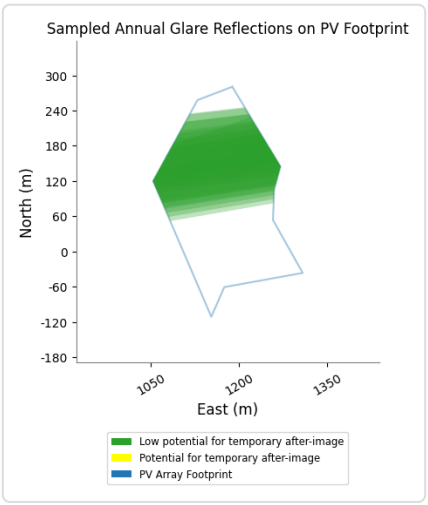
Green glare: 19 min.







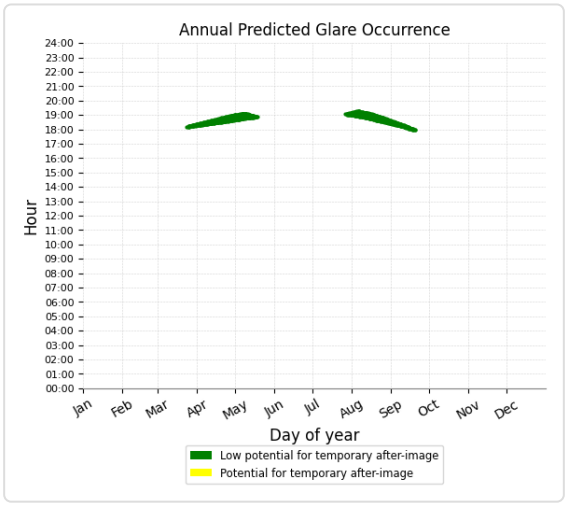


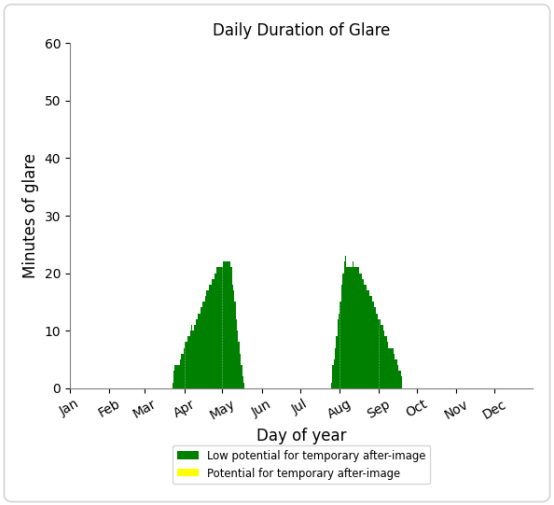


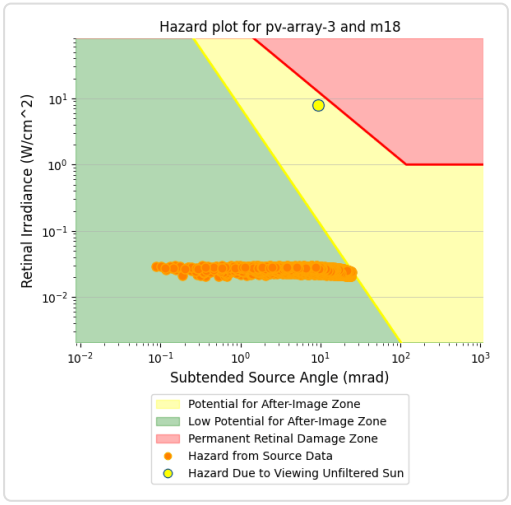
PV array 3 and Route: M18

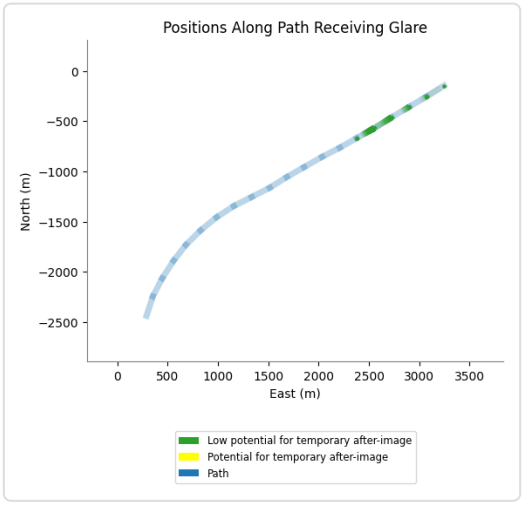
Yellow glare: none

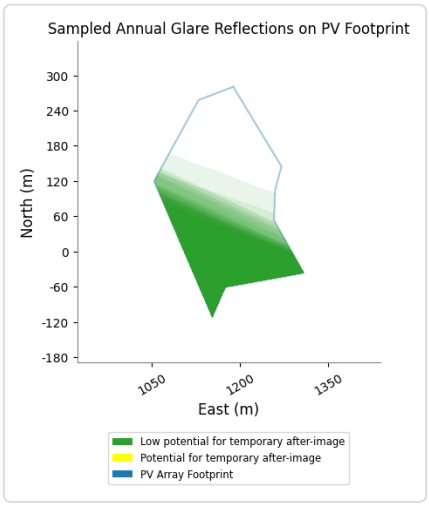
Green glare: 1,490 min.











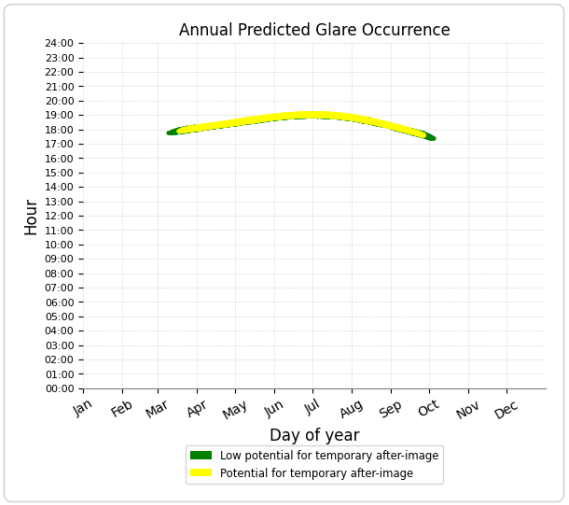
PV array 3 and Route: B6093

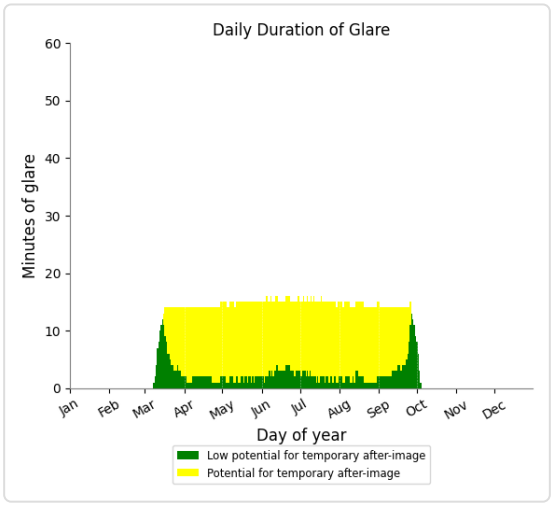
No glare found

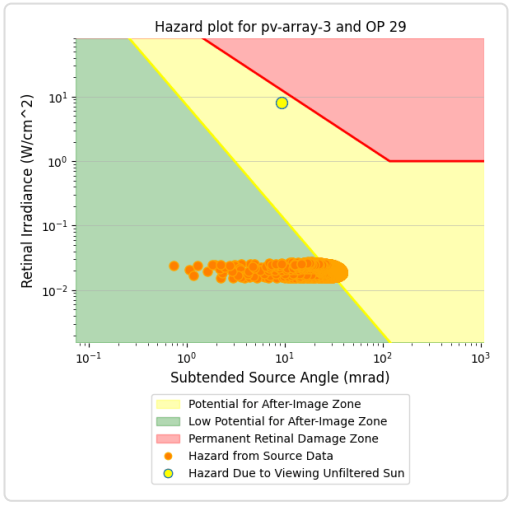
PV array 3 and OP 29

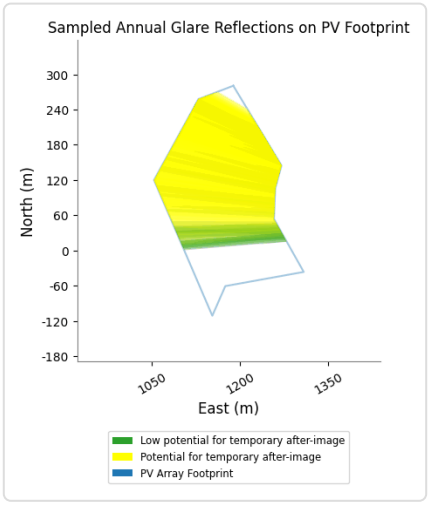
Yellow glare: 2,390 min.

Green glare: 578 min.





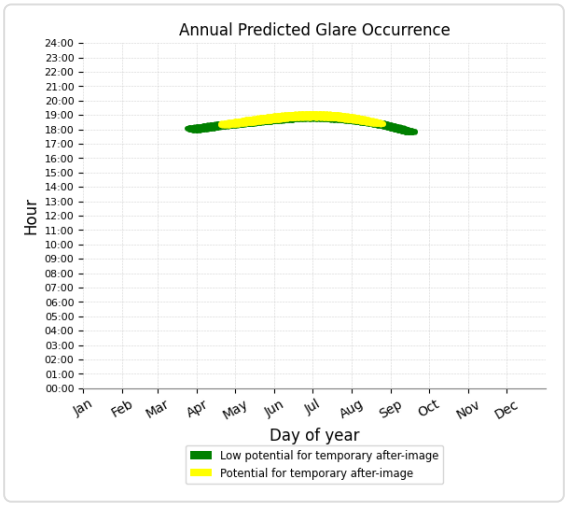


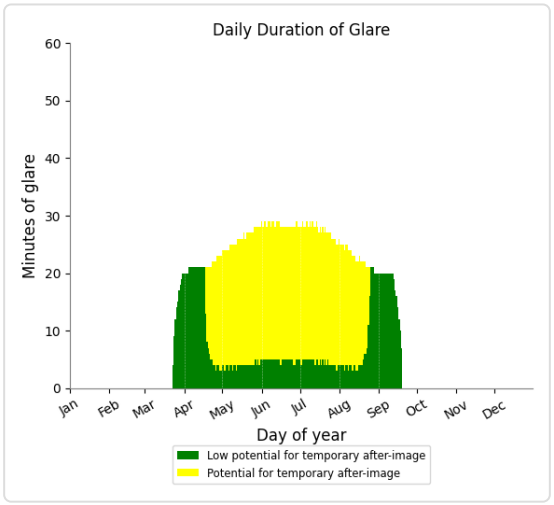


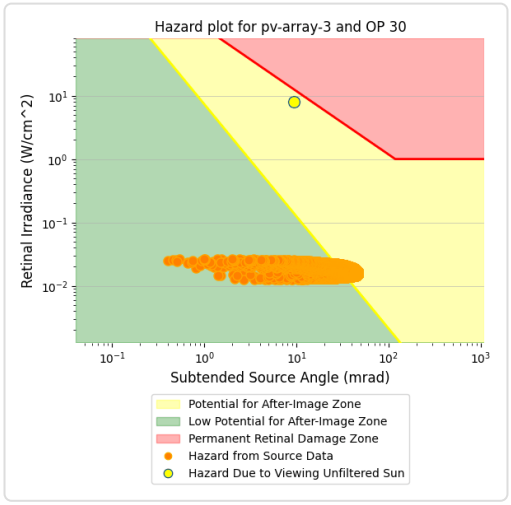
PV array 3 and OP 30

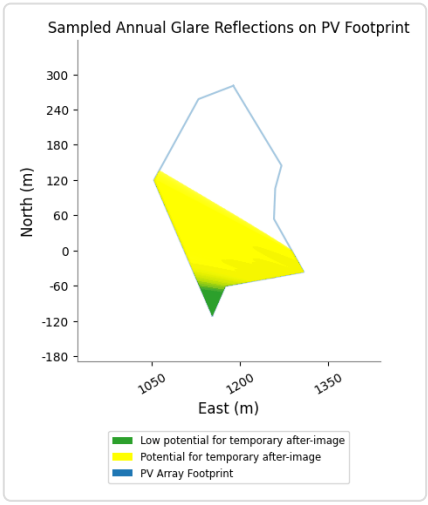
Yellow glare: 2,774 min.

Green glare: 1,539 min.





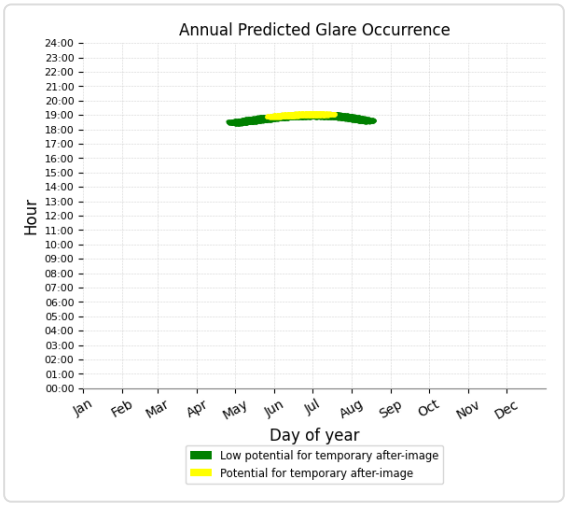


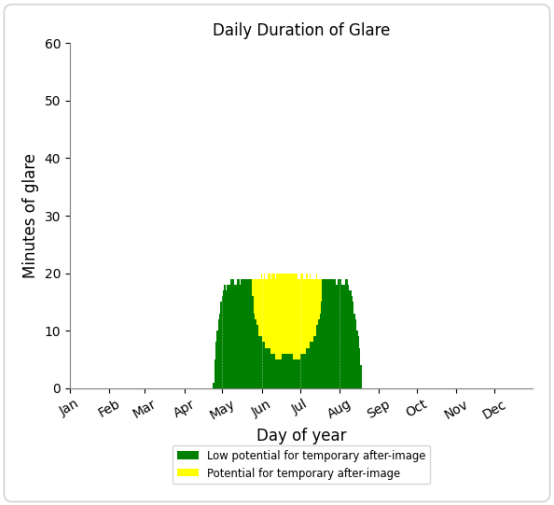


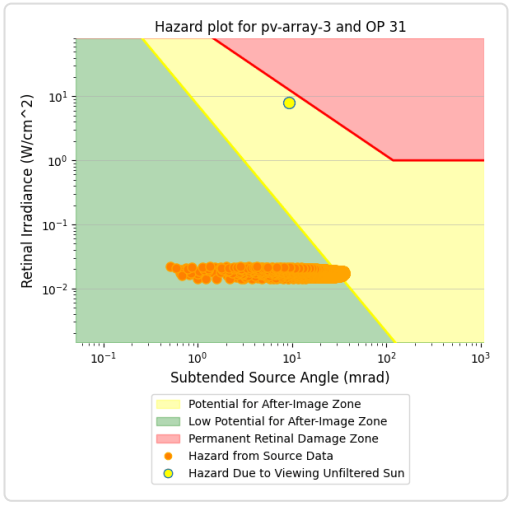
PV array 3 and OP 31

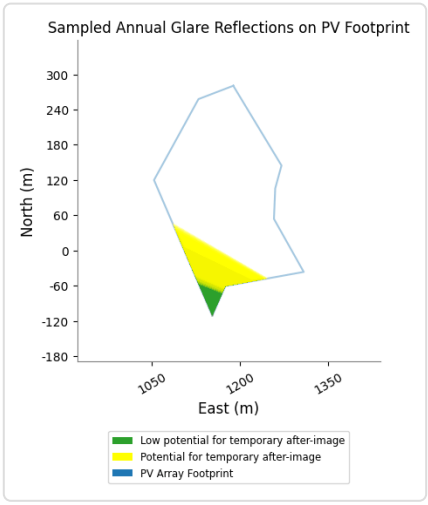
Yellow glare: 659 min.

Green glare: 1,436 min.





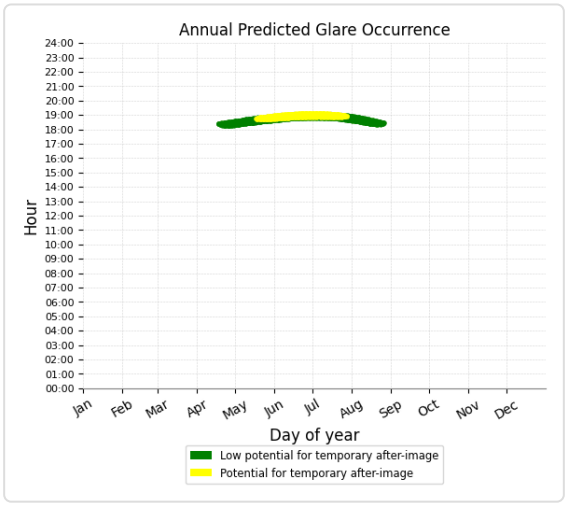


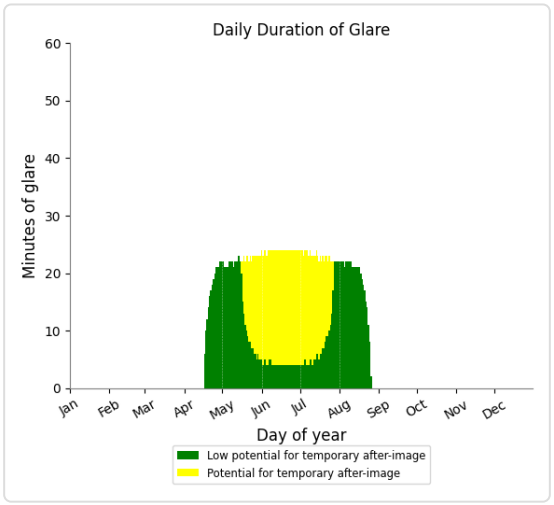


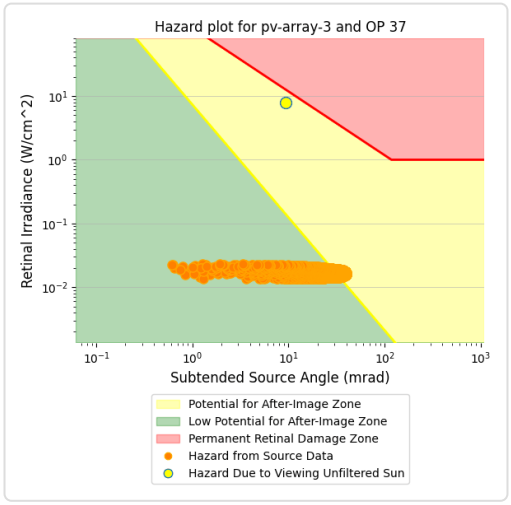
PV array 3 and OP 37

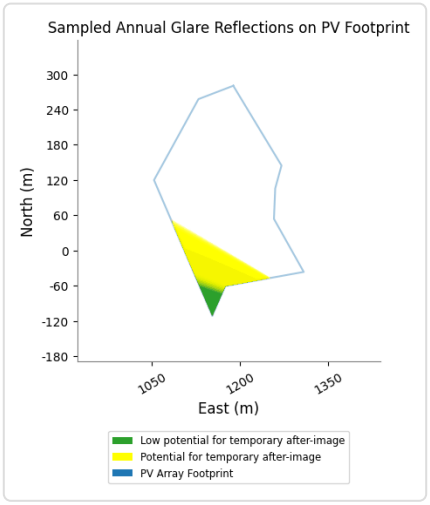
Yellow glare: 1,260 min.

Green glare: 1,587 min.





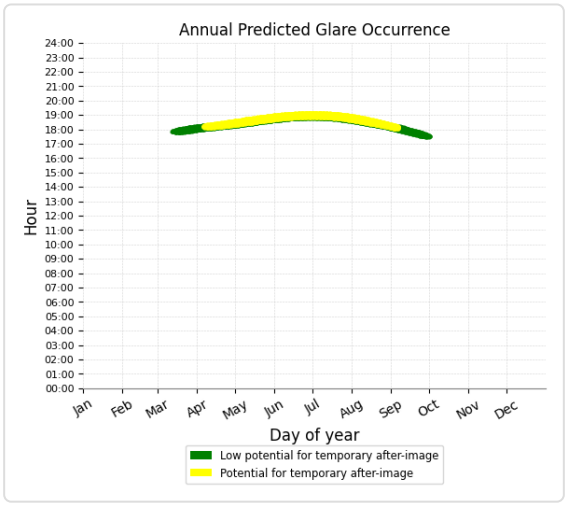


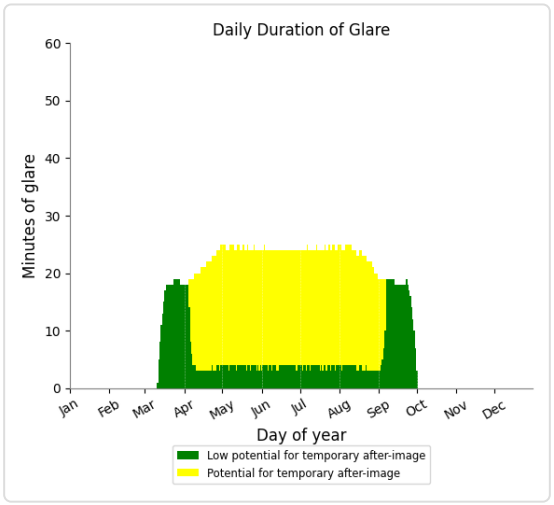


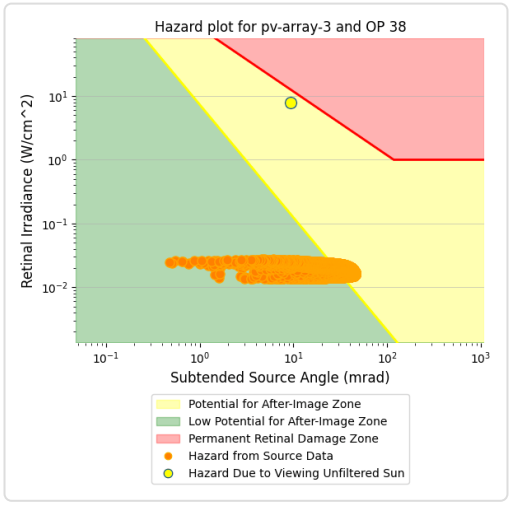
PV array 3 and OP 38

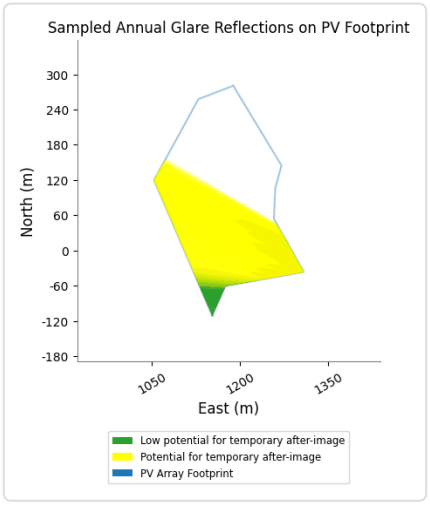
Yellow glare: 3,028 min.

Green glare: 1,402 min.





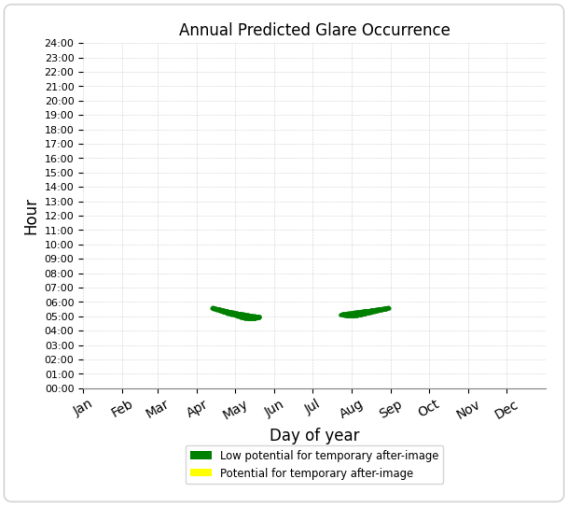


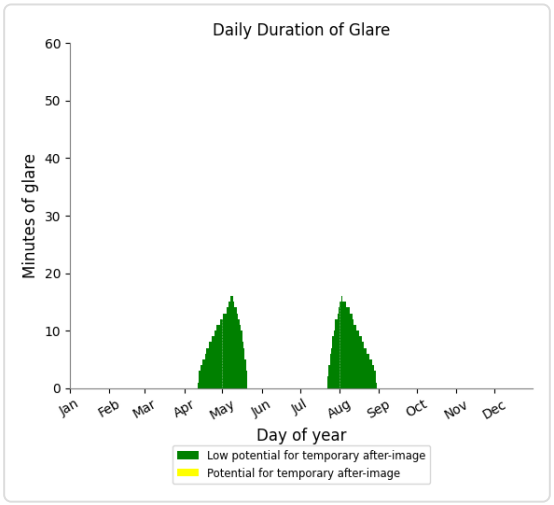


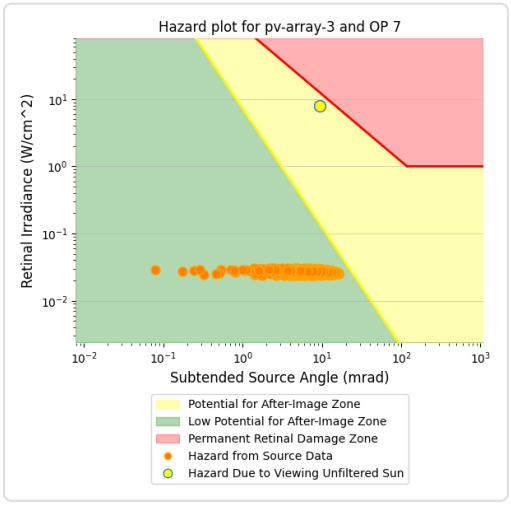
PV array 3 and OP 7

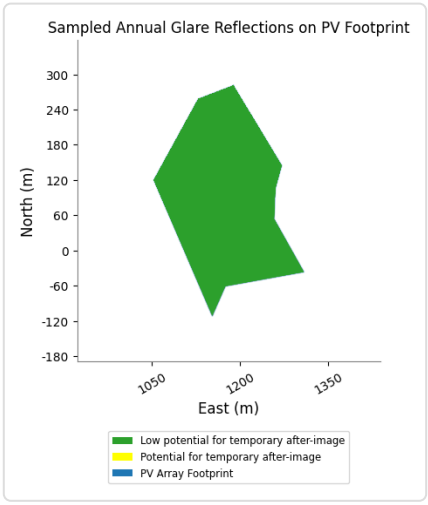
Yellow glare: none

Green glare: 749 min.





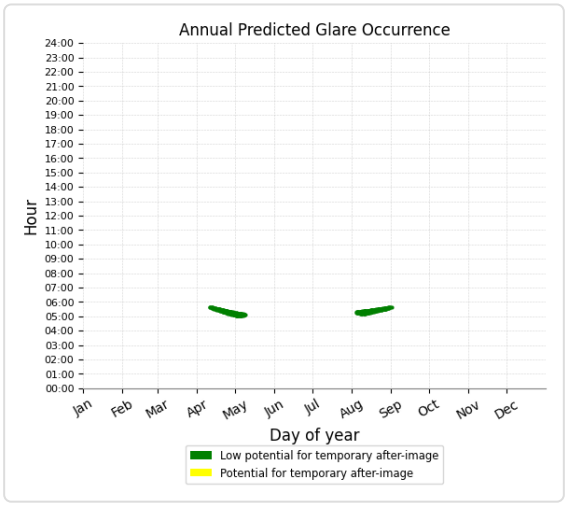


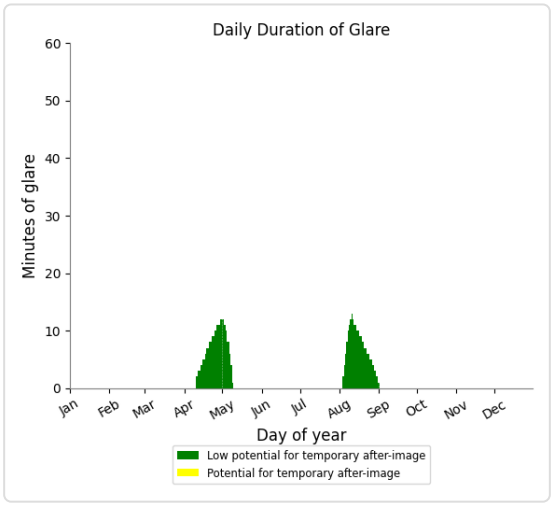


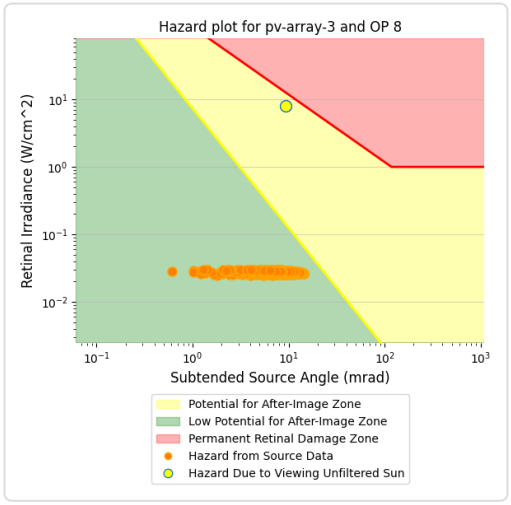
PV array 3 and OP 8

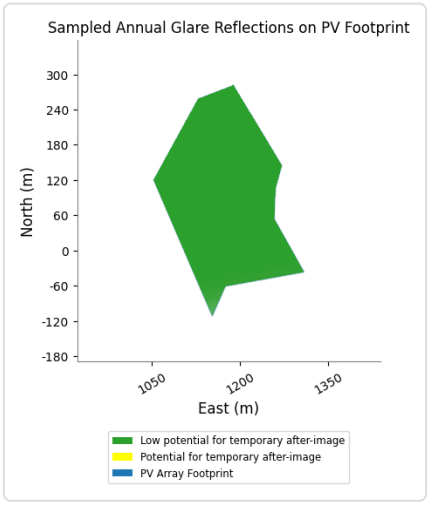
Yellow glare: none

Green glare: 423 min.





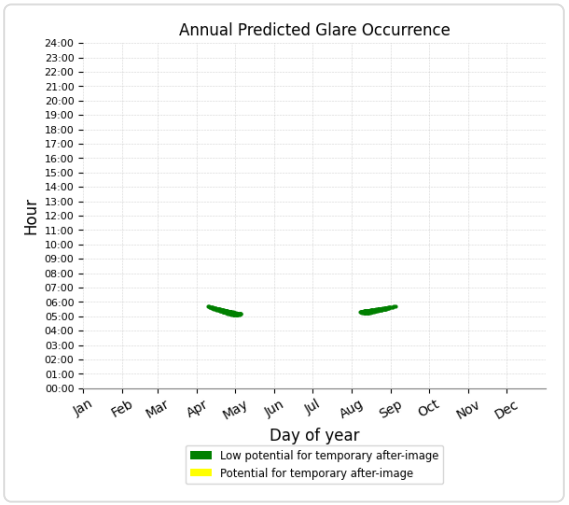


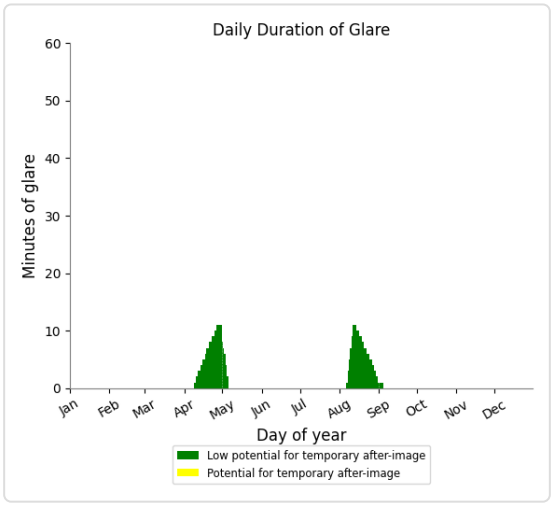


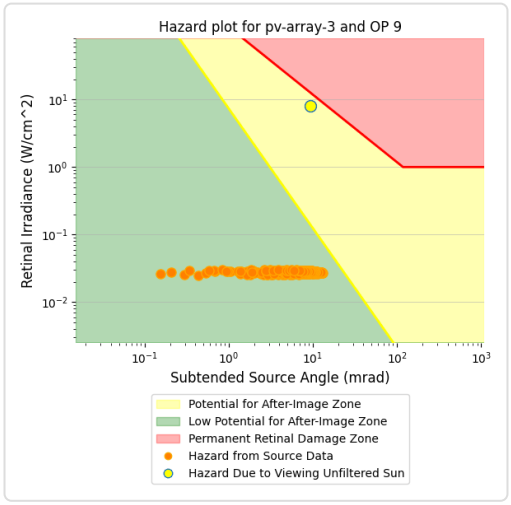
PV array 3 and OP 9

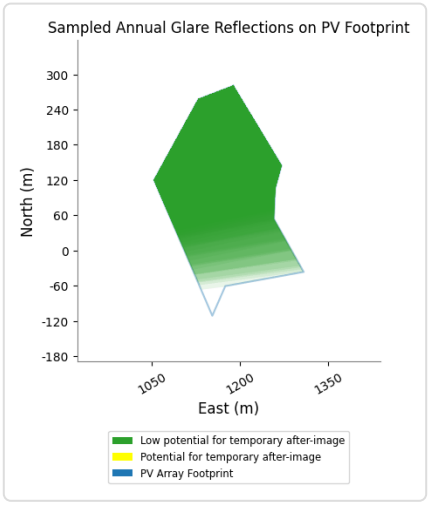
Yellow glare: none

Green glare: 340 min.





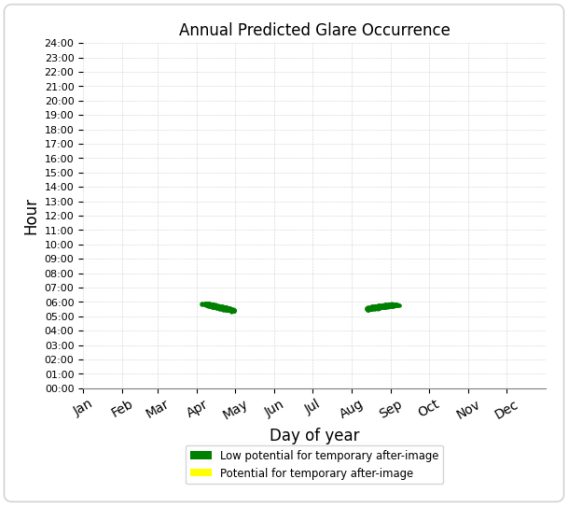


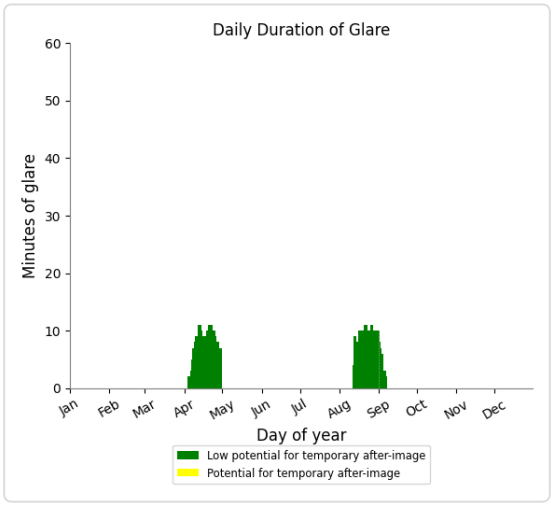


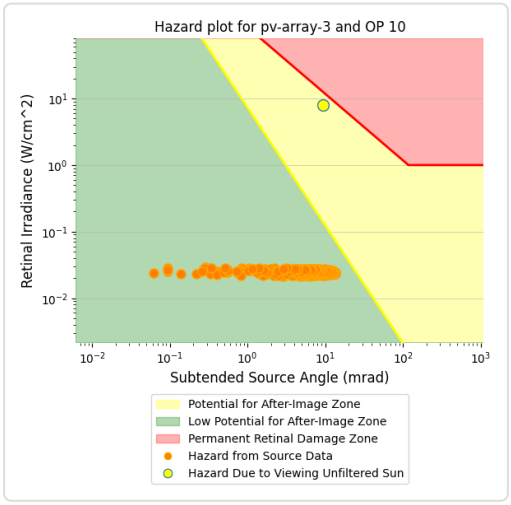
PV array 3 and OP 10

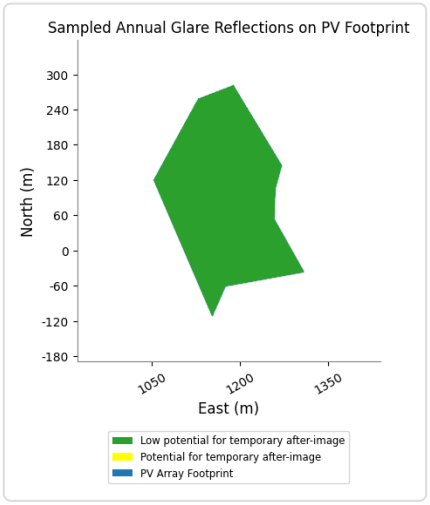
Yellow glare: none

Green glare: 462 min.



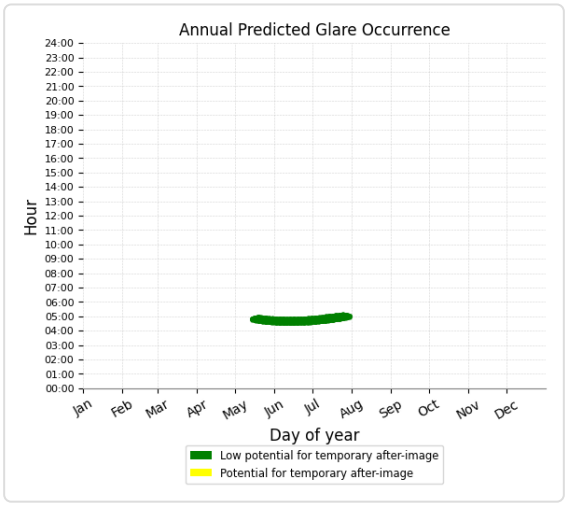


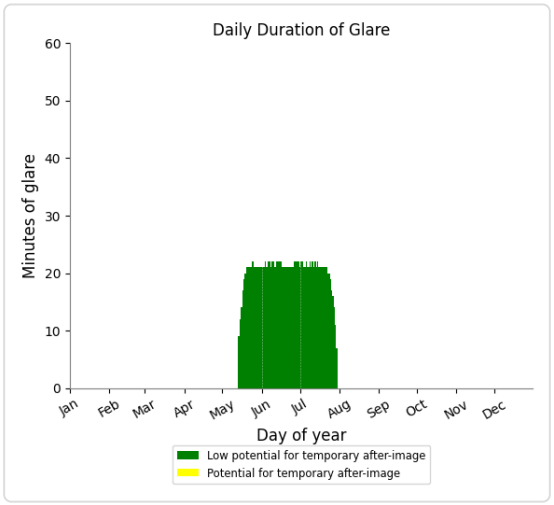


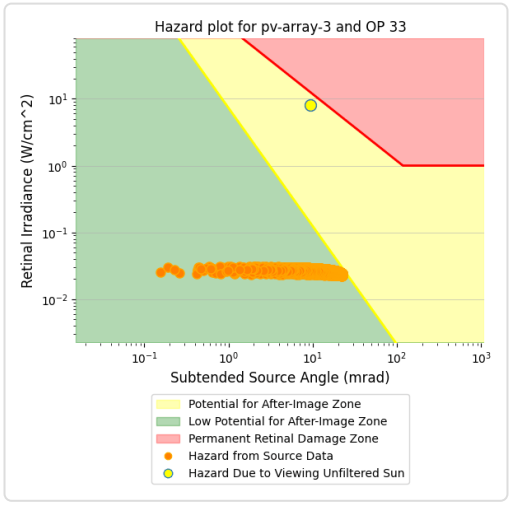


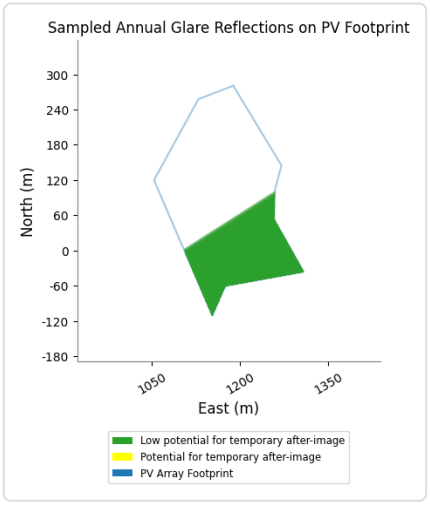
PV array 3 and OP 33

Yellow glare: none
Green glare: 1,580 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 11

No glare found

PV array 3 and OP 12

No glare found

PV array 3 and OP 13

No glare found

PV array 3 and OP 14

No glare found

PV array 3 and OP 15

No glare found

PV array 3 and OP 16

No glare found

PV array 3 and OP 17

No glare found

PV array 3 and OP 18

No glare found

PV array 3 and OP 19

No glare found

PV array 3 and OP 20

No glare found

PV array 3 and OP 21

No glare found

PV array 3 and OP 22

No glare found

PV array 3 and OP 23

No glare found

PV array 3 and OP 24

No glare found

PV array 3 and OP 25

No glare found

PV array 3 and OP 26

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 32

No glare found

PV array 3 and OP 34

No glare found

PV array 3 and OP 35

No glare found

PV array 3 and OP 36

No glare found

PV: PV array 4 potential temporary after-image

Receptor results ordered by category of glare

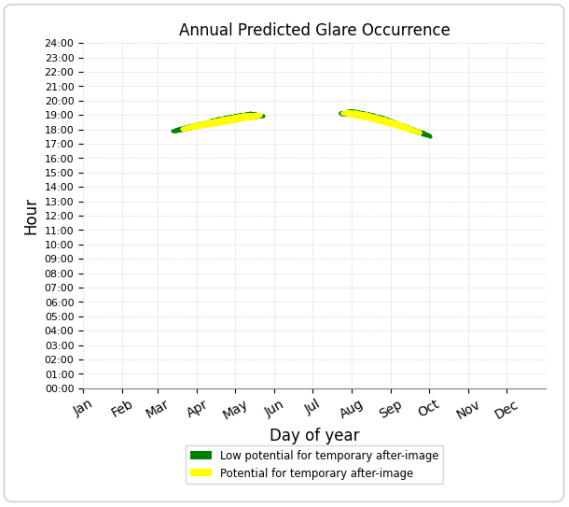
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
B6094 and Ruddle Lane	361	6.0	1,553	25.9
M18	1,616	26.9	1,329	22.1
Arbour lane	1,063	17.7	0	0.0
B6093	0	0.0	0	0.0
OP 6	728	12.1	957	15.9
OP 31	591	9.8	720	12.0
OP 32	1,210	20.2	371	6.2
OP 33	1,843	30.7	1,748	29.1
OP 37	545	9.1	583	9.7
OP 7	445	7.4	0	0.0
OP 8	219	3.6	0	0.0
OP 10	533	8.9	0	0.0
OP 30	512	8.5	0	0.0
OP 38	156	2.6	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

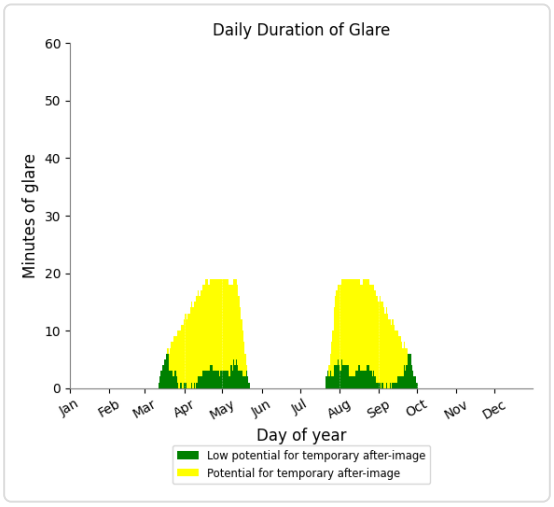
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0

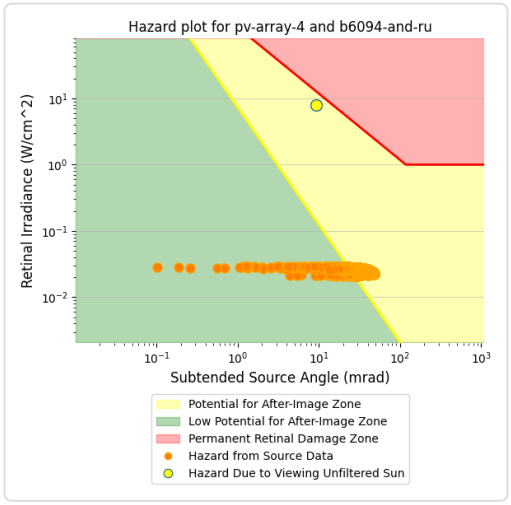
PV array 4 and Route: B6094 and Ruddle Lane

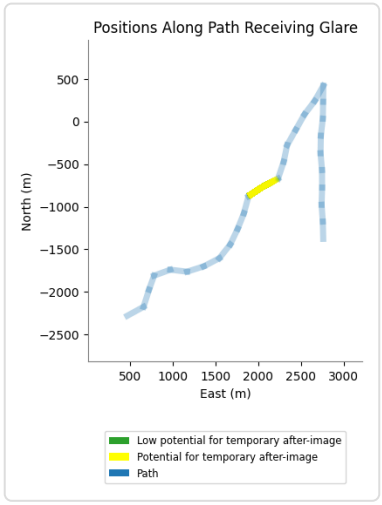
Yellow glare: 1,553 min.

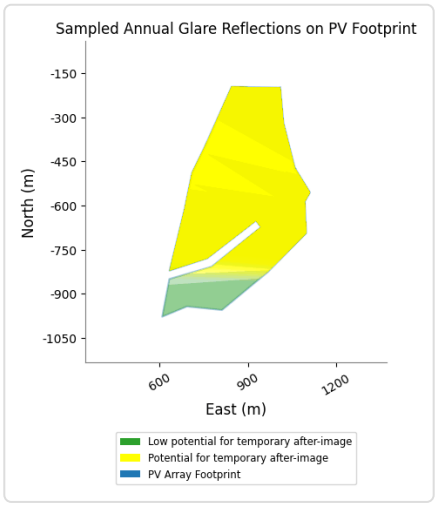
Green glare: 361 min.







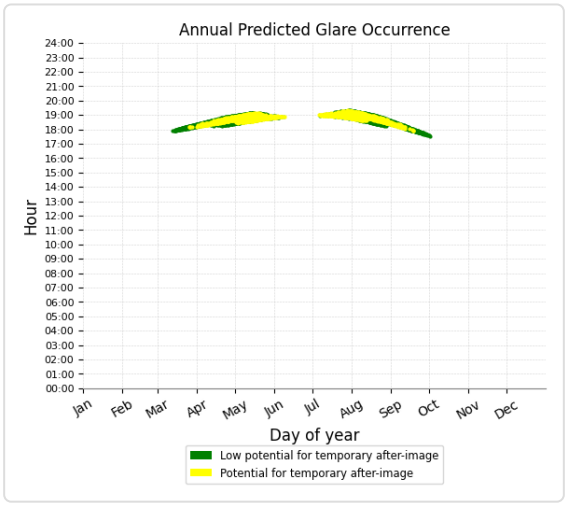


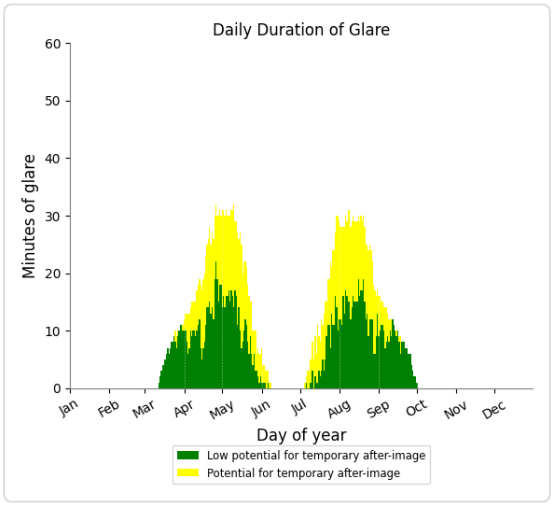


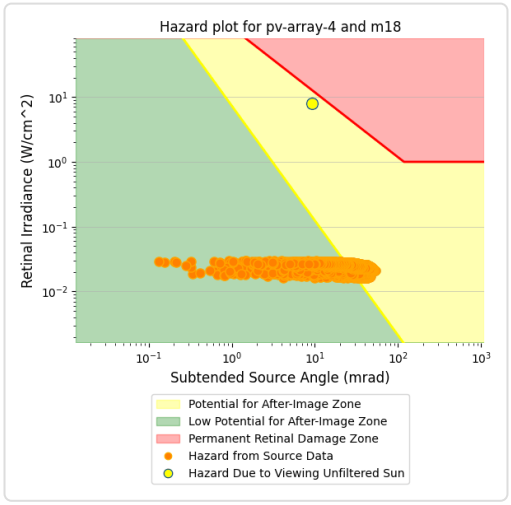
PV array 4 and Route: M18

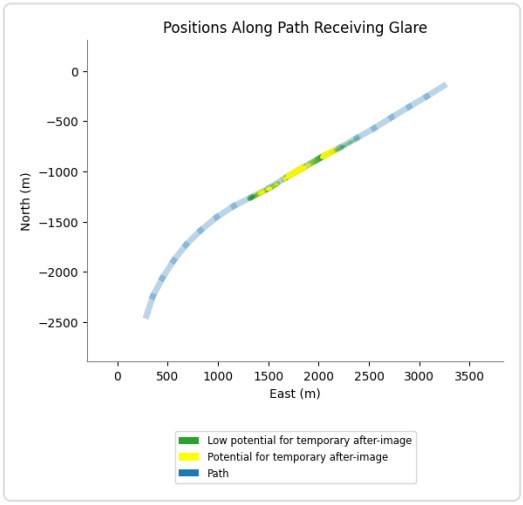
Yellow glare: 1,329 min.

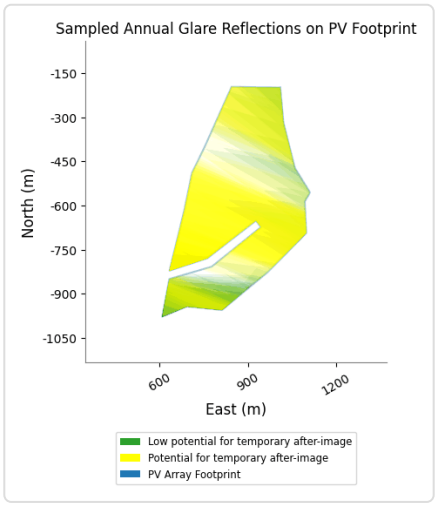
Green glare: 1,616 min.







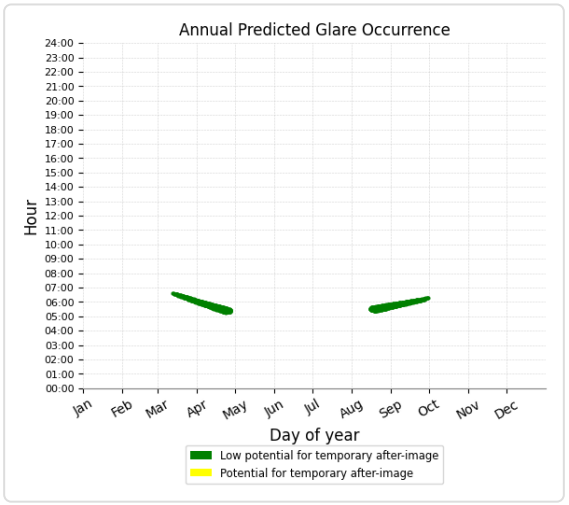


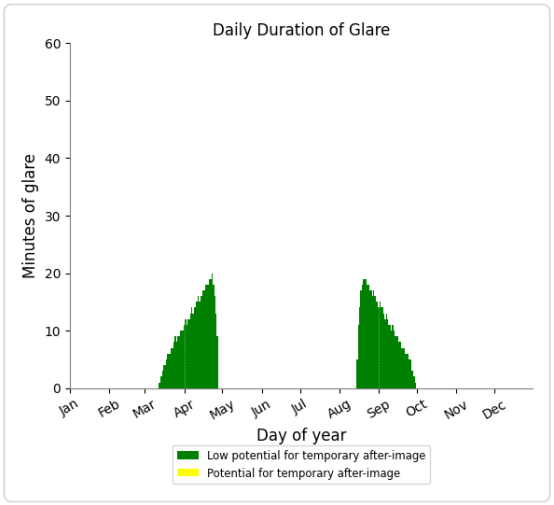


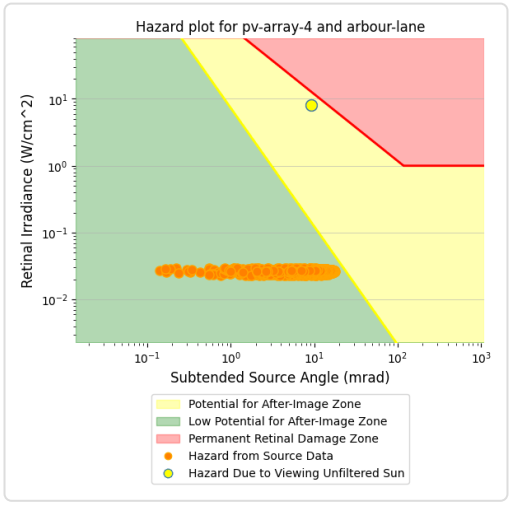
PV array 4 and Route: Arbour lane

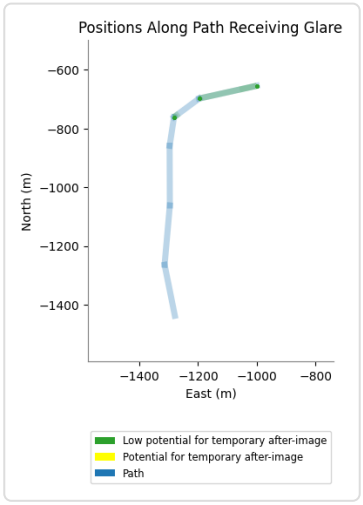
Yellow glare: none

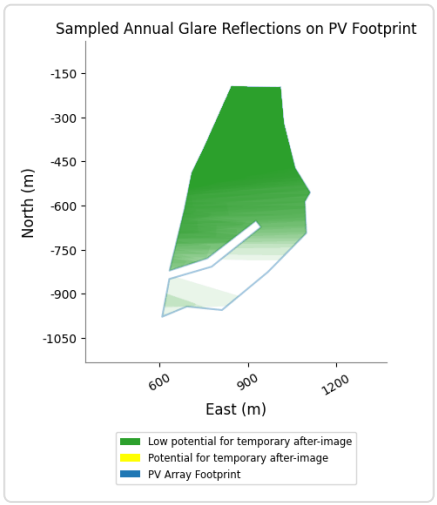
Green glare: 1,063 min.











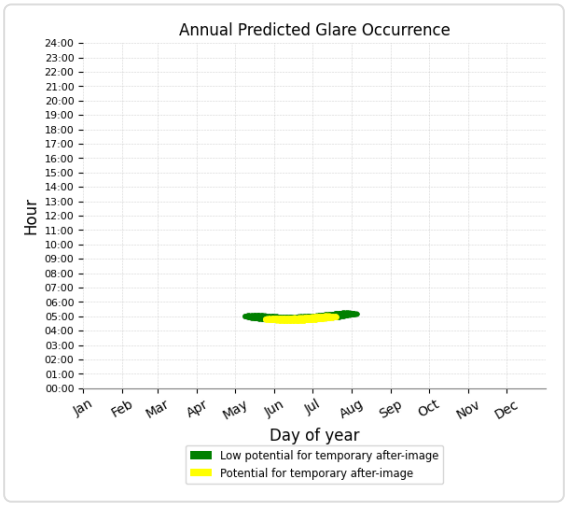
PV array 4 and Route: B6093

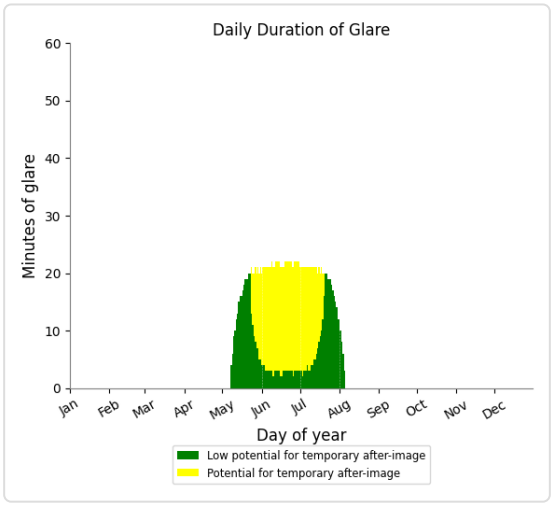
No glare found

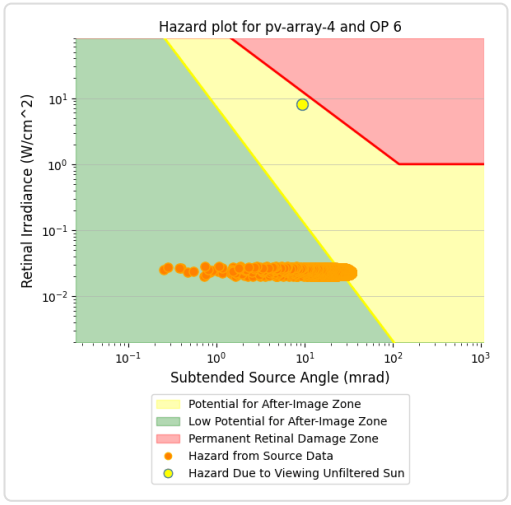
PV array 4 and OP 6

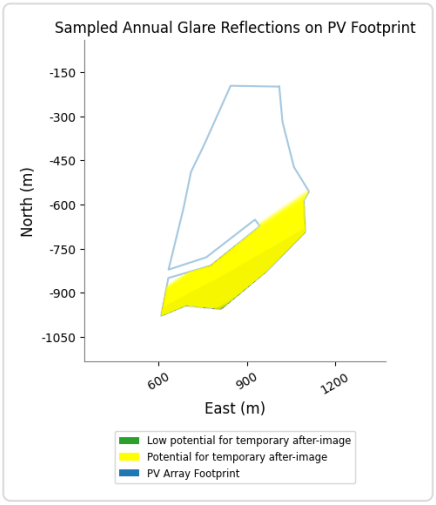
Yellow glare: 957 min.

Green glare: 728 min.





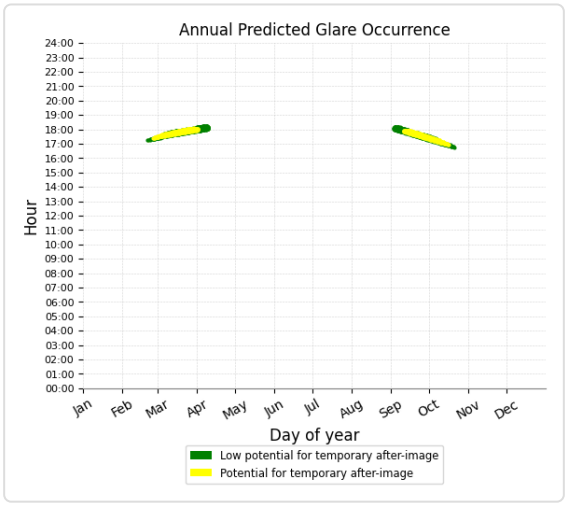


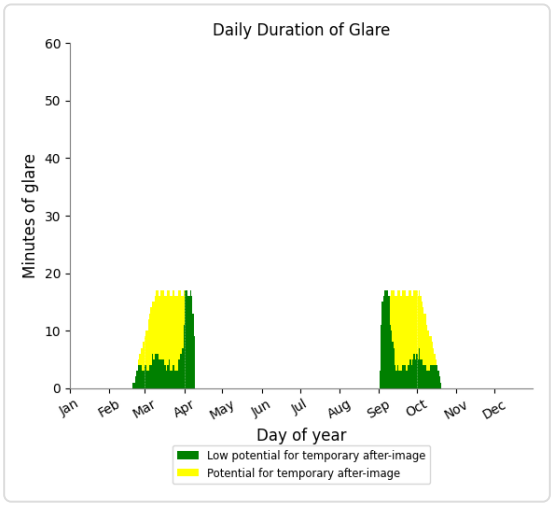


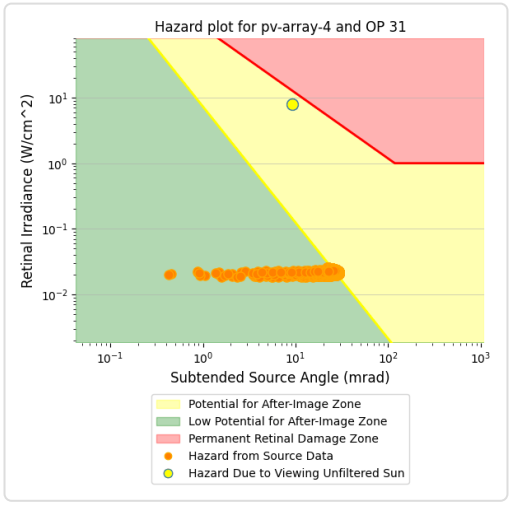
PV array 4 and OP 31

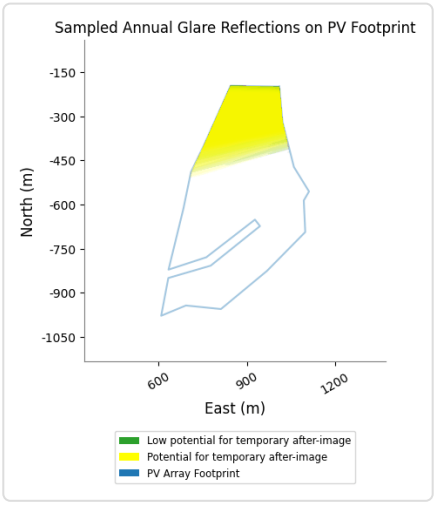
Yellow glare: 720 min.

Green glare: 591 min.





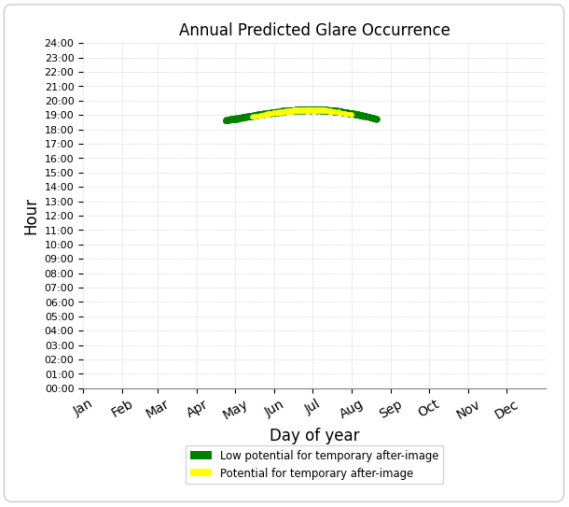


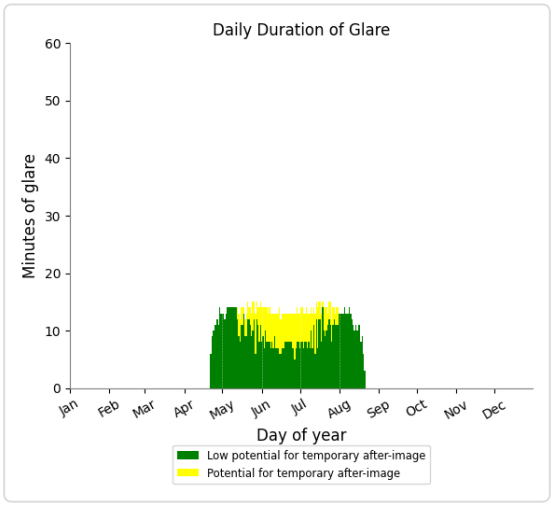


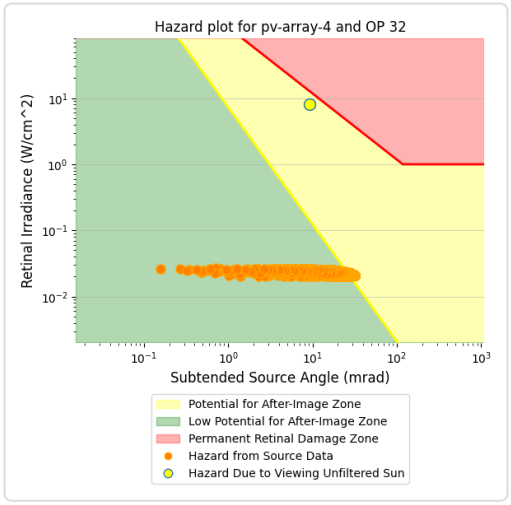
PV array 4 and OP 32

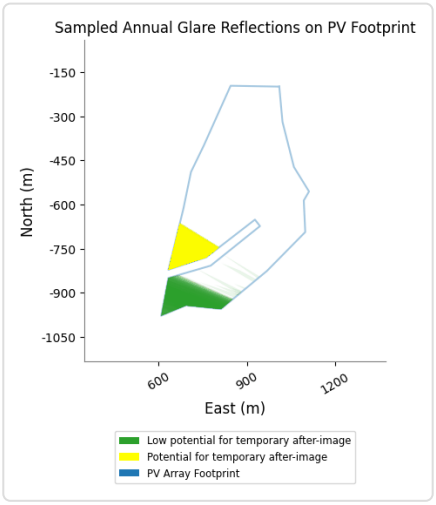
Yellow glare: 371 min.

Green glare: 1,210 min.





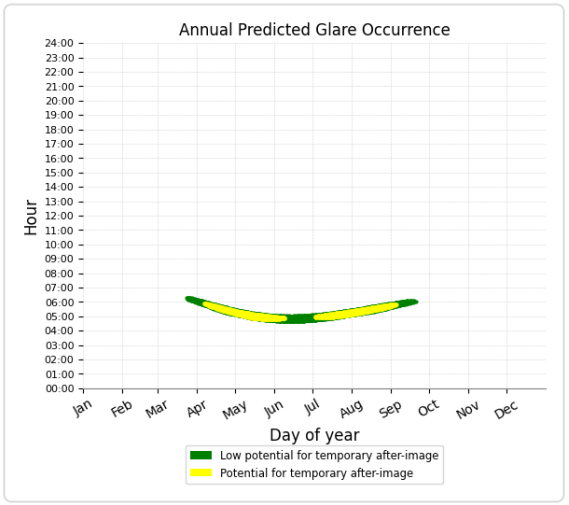


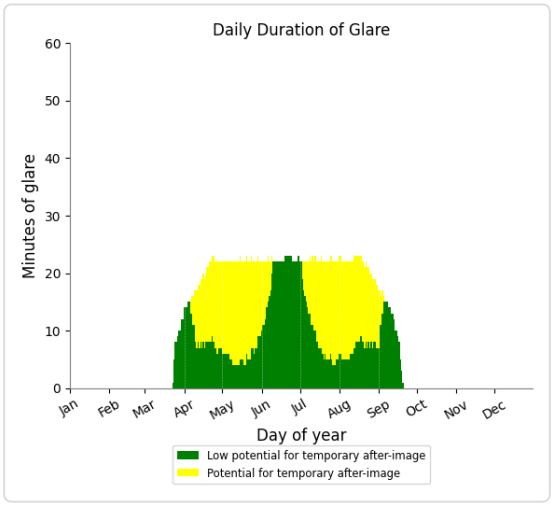


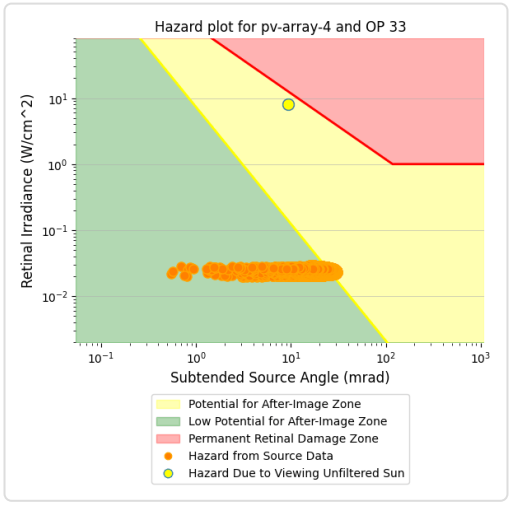
PV array 4 and OP 33

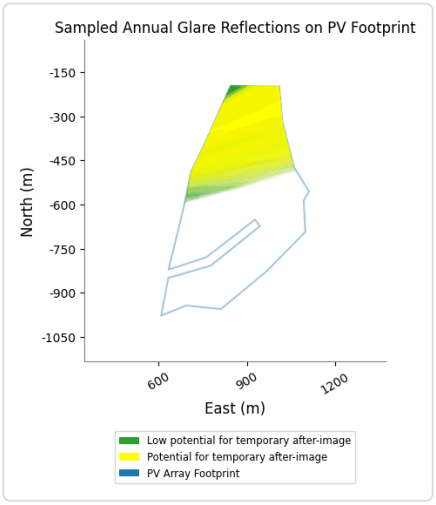
Yellow glare: 1,748 min.

Green glare: 1,843 min.





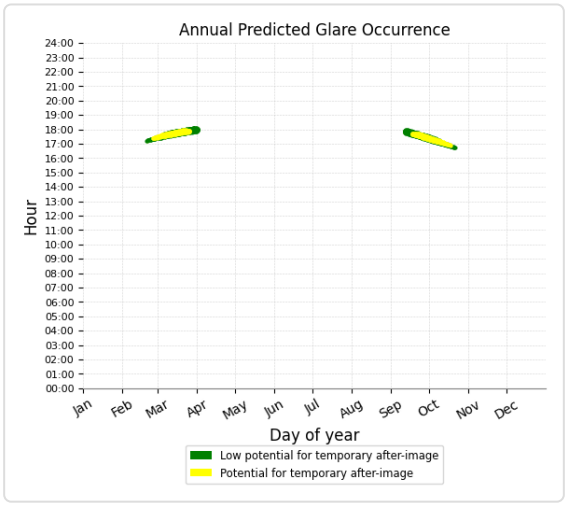


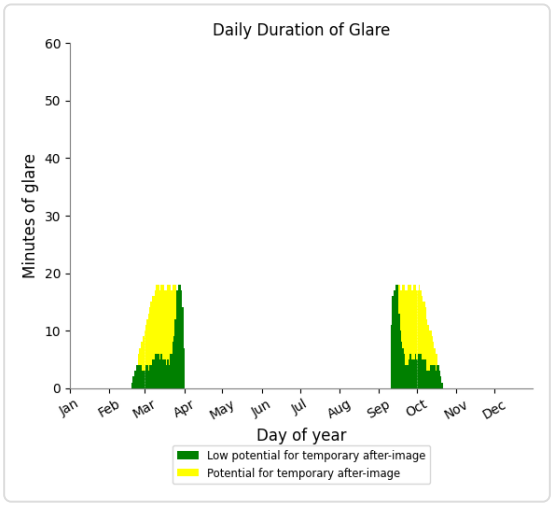


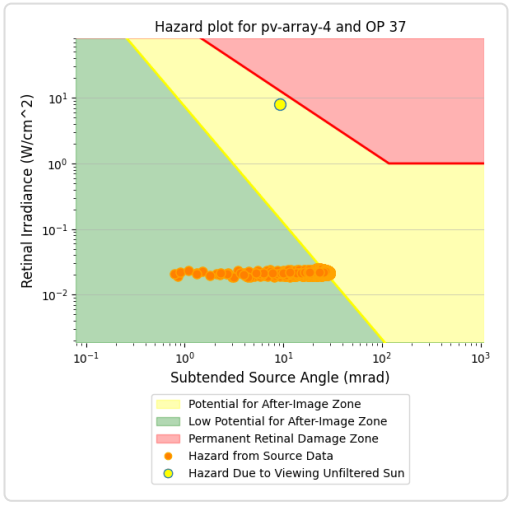
PV array 4 and OP 37

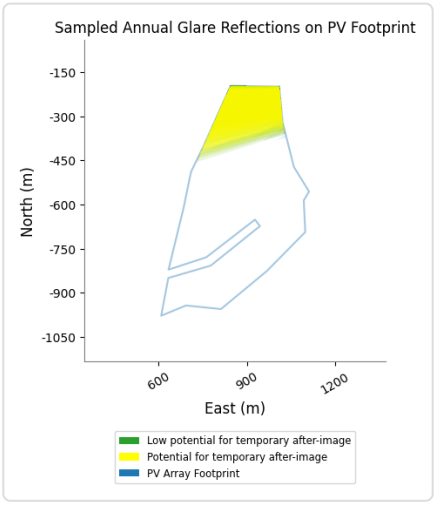
Yellow glare: 583 min.

Green glare: 545 min.





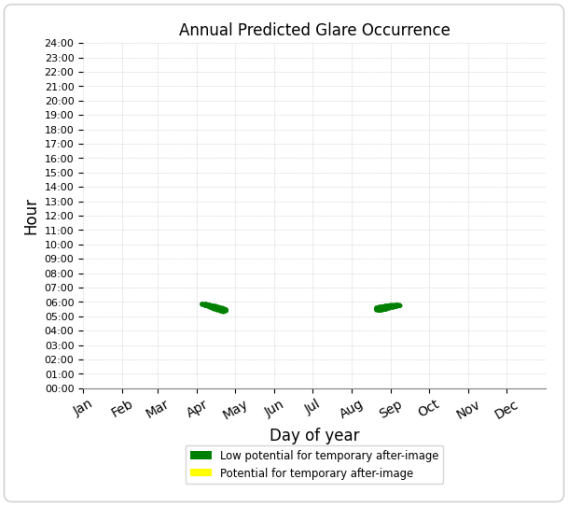


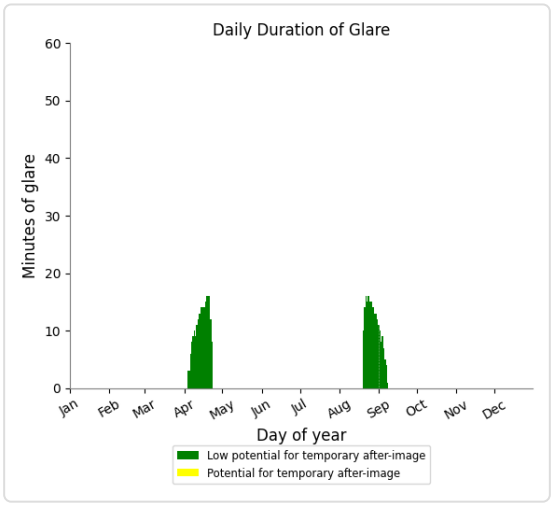


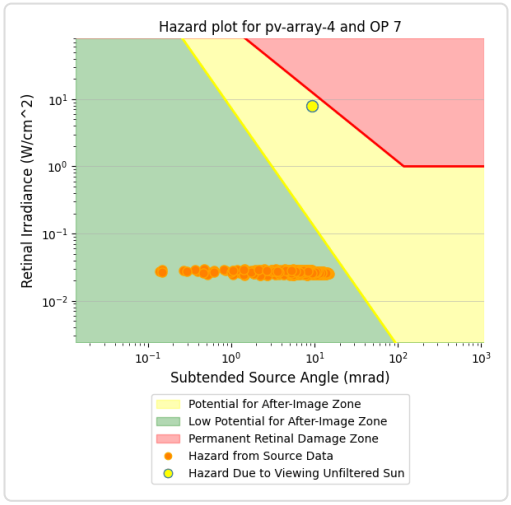
PV array 4 and OP 7

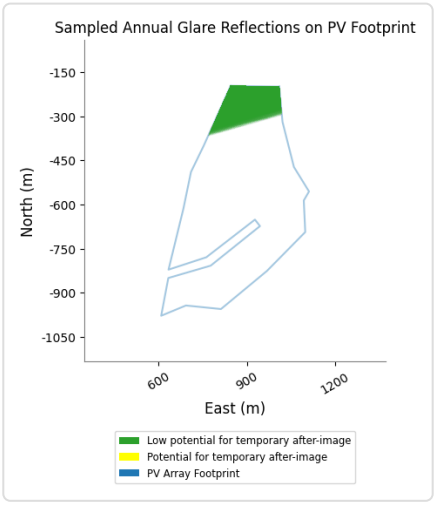
Yellow glare: none

Green glare: 445 min.





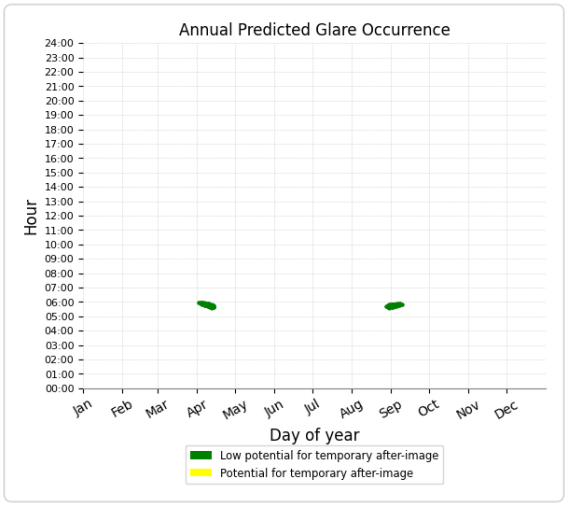


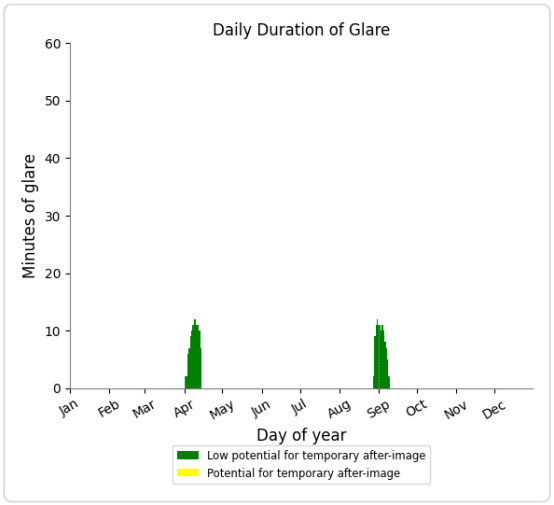


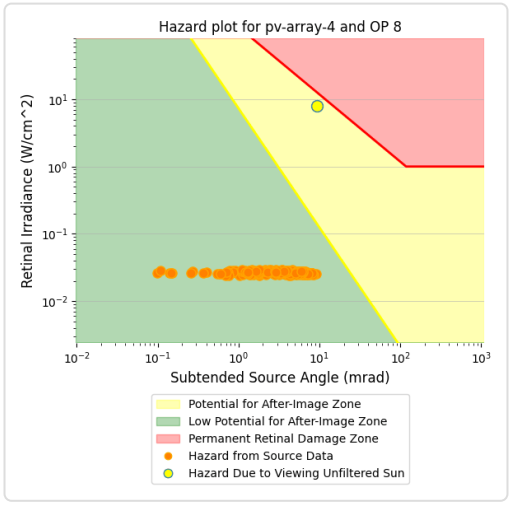
PV array 4 and OP 8

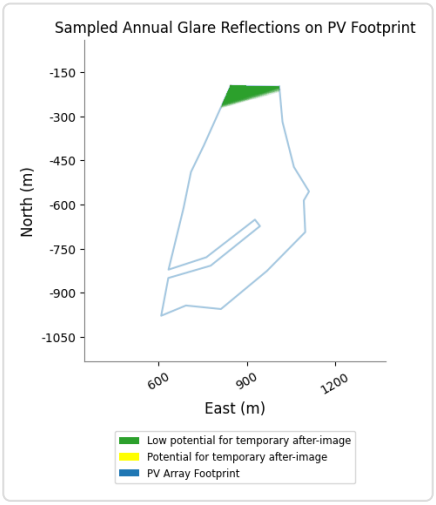
Yellow glare: none

Green glare: 219 min.





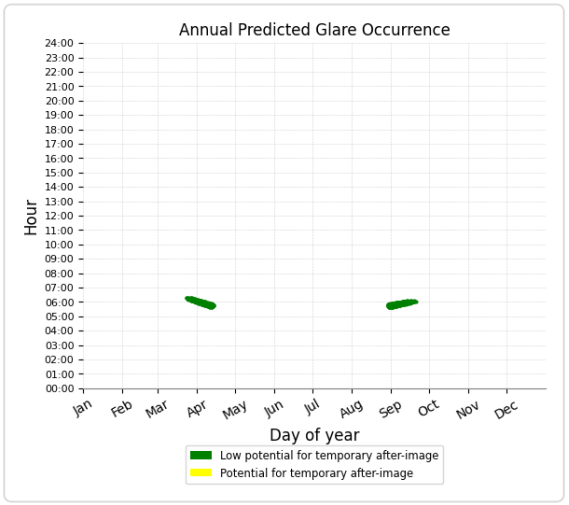


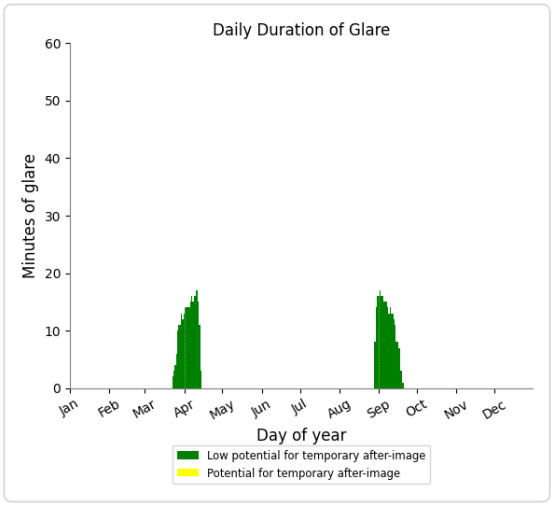


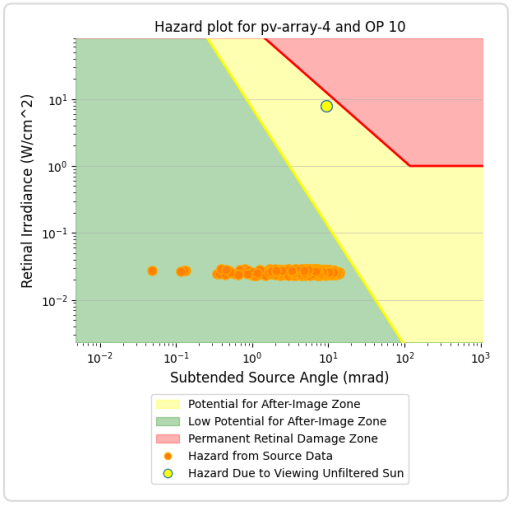
PV array 4 and OP 10

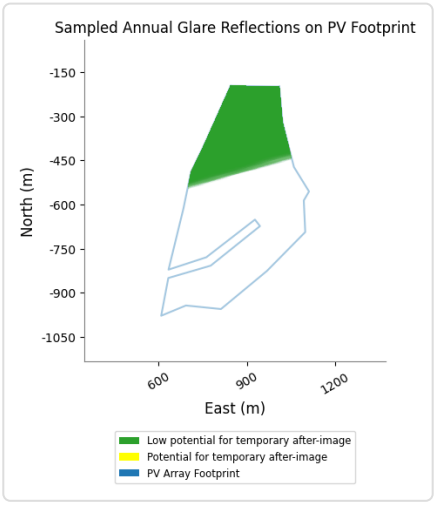
Yellow glare: none

Green glare: 533 min.





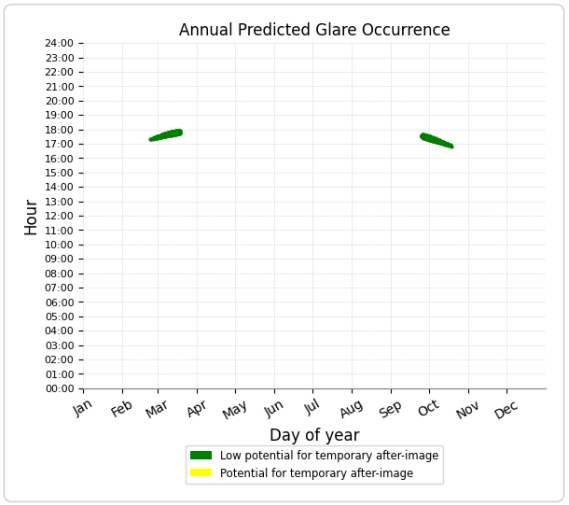


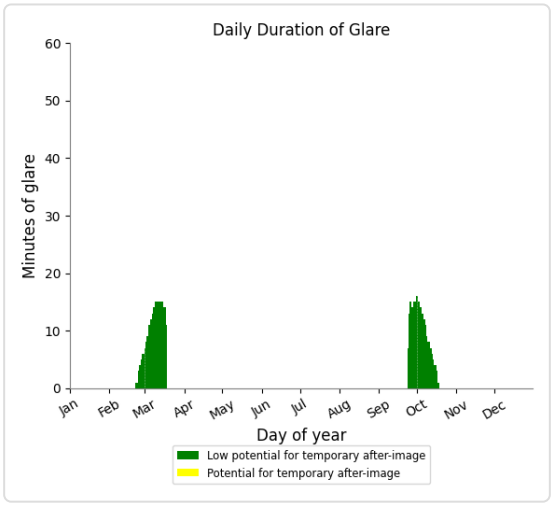


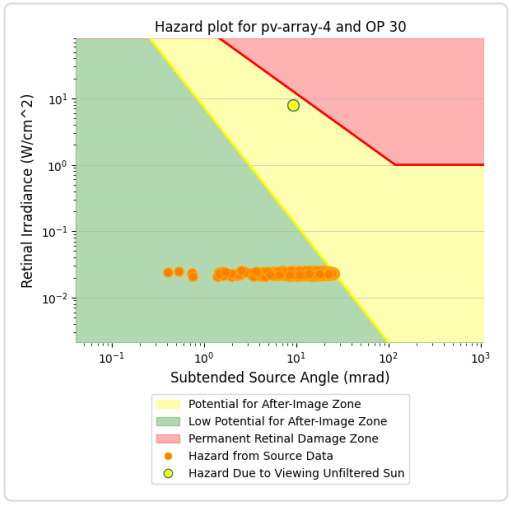
PV array 4 and OP 30

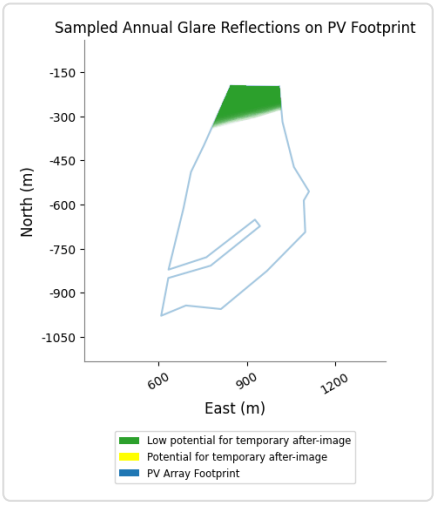
Yellow glare: none

Green glare: 512 min.





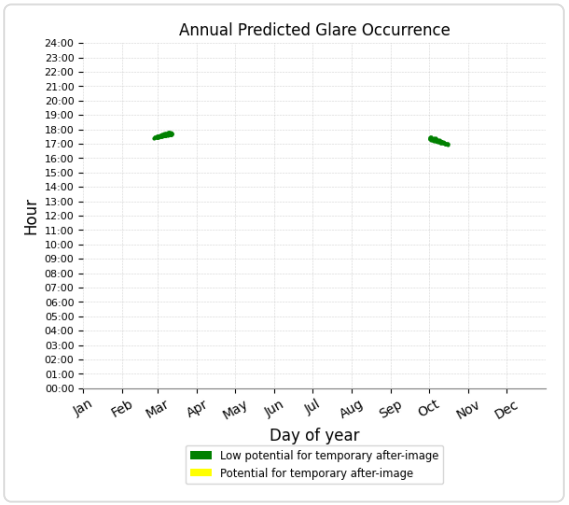


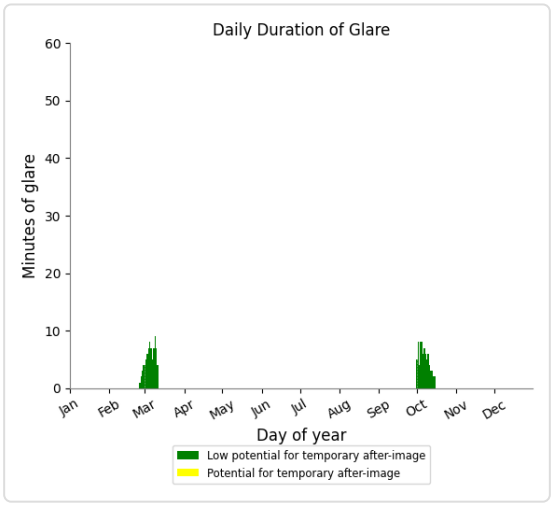


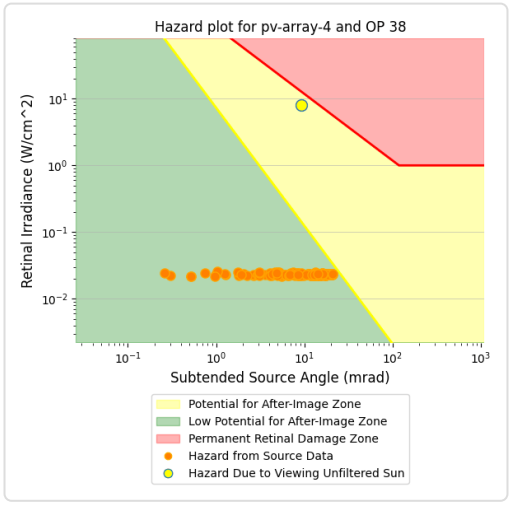
PV array 4 and OP 38

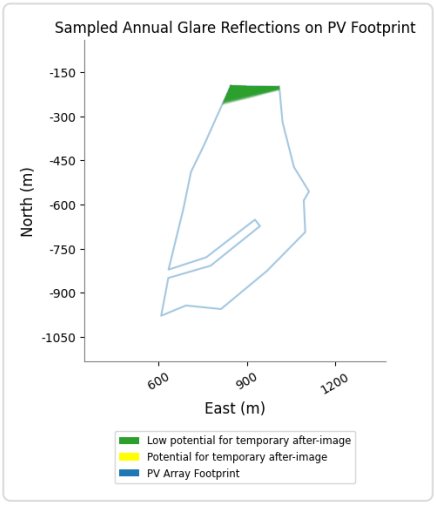
Yellow glare: none

Green glare: 156 min.









PV array 4 and OP 1

No glare found

PV array 4 and OP 2

No glare found

PV array 4 and OP 3

No glare found

PV array 4 and OP 4

No glare found

PV array 4 and OP 5

No glare found

PV array 4 and OP 9

No glare found

PV array 4 and OP 11

No glare found

PV array 4 and OP 12

No glare found

PV array 4 and OP 13

No glare found

PV array 4 and OP 14

No glare found

PV array 4 and OP 15

No glare found

PV array 4 and OP 16

No glare found

PV array 4 and OP 17

No glare found

PV array 4 and OP 18

No glare found

PV array 4 and OP 19

No glare found

PV array 4 and OP 20

No glare found

PV array 4 and OP 21

No glare found

PV array 4 and OP 22

No glare found

PV array 4 and OP 23

No glare found

PV array 4 and OP 24

No glare found

PV array 4 and OP 25

No glare found

PV array 4 and OP 26

No glare found

PV array 4 and OP 27

No glare found

PV array 4 and OP 28

No glare found

PV array 4 and OP 29

No glare found

PV array 4 and OP 34

No glare found

PV array 4 and OP 35

No glare found

PV array 4 and OP 36

No glare found

PV: PV array 5 potential temporary after-image

Receptor results ordered by category of glare

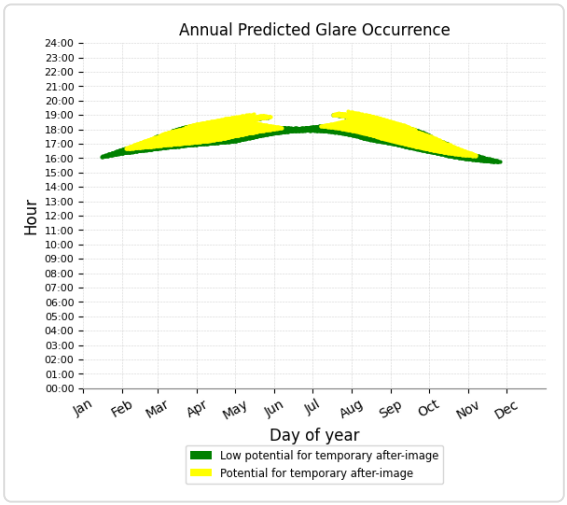
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
B6094 and Ruddle Lane	4,780	79.7	12,003	200.1
M18	1,953	32.5	6,827	113.8
Arbour lane	36	0.6	0	0.0
B6093	0	0.0	0	0.0
OP 6	936	15.6	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0

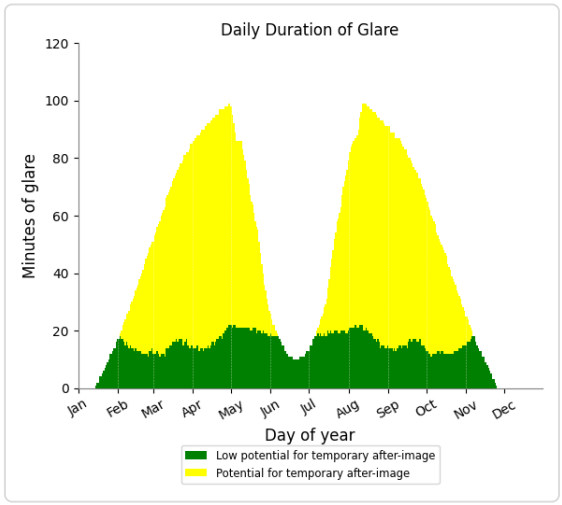
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0

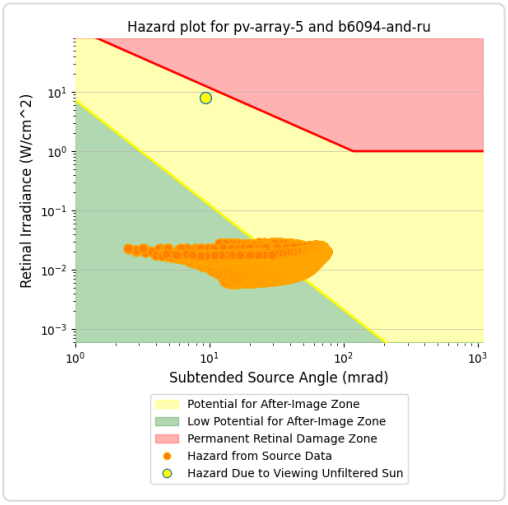
PV array 5 and Route: B6094 and Ruddle Lane

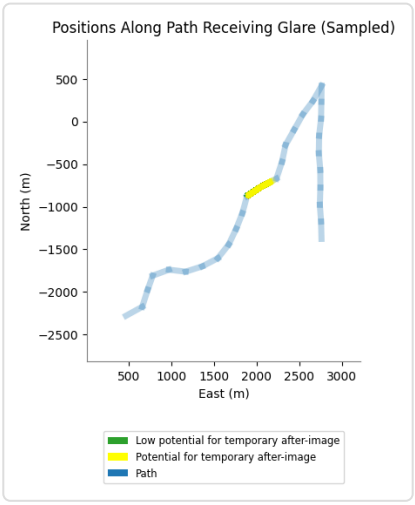
Yellow glare: 12,003 min.

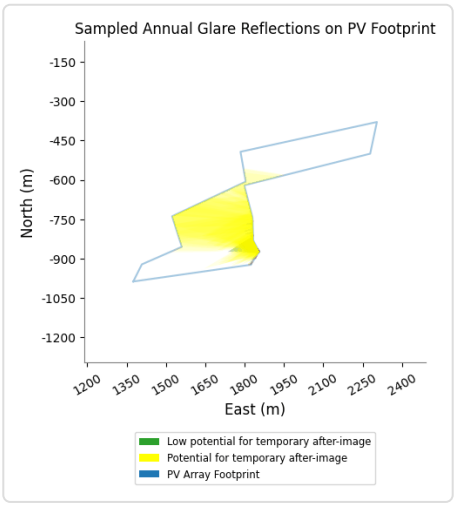
Green glare: 4,780 min.







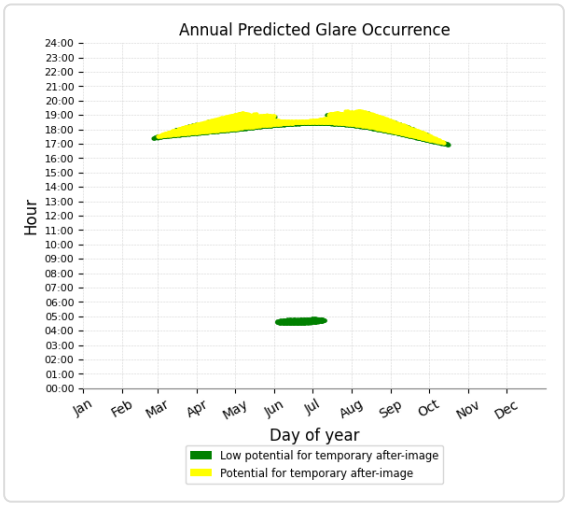


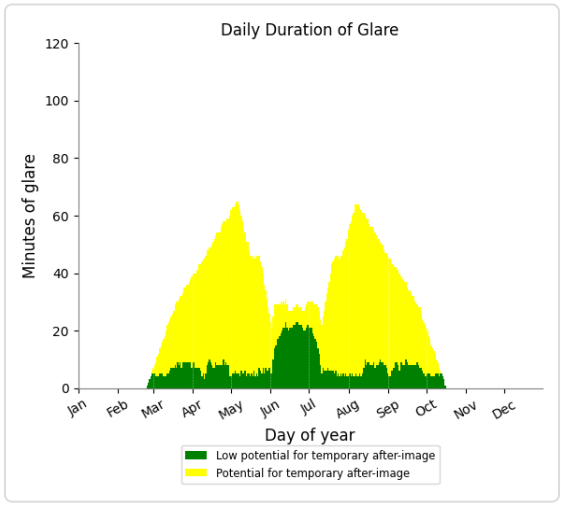


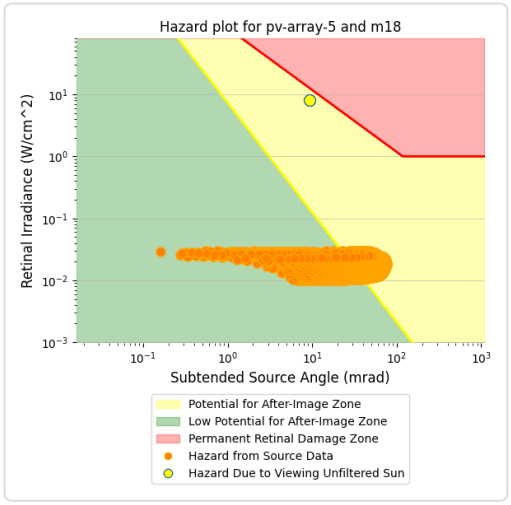
PV array 5 and Route: M18

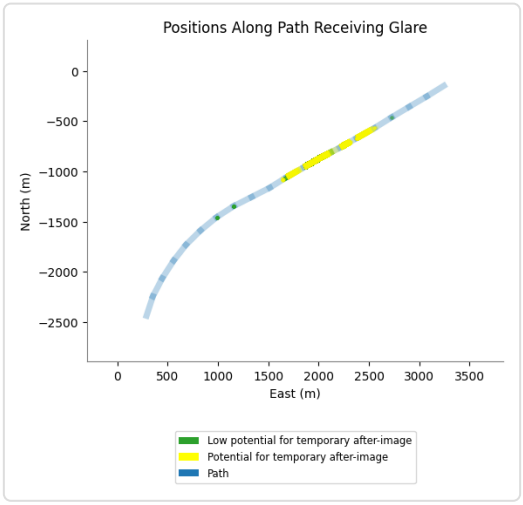
Yellow glare: 6,827 min.

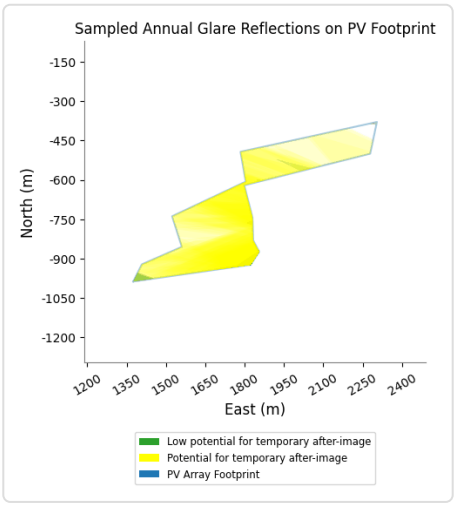
Green glare: 1,953 min.







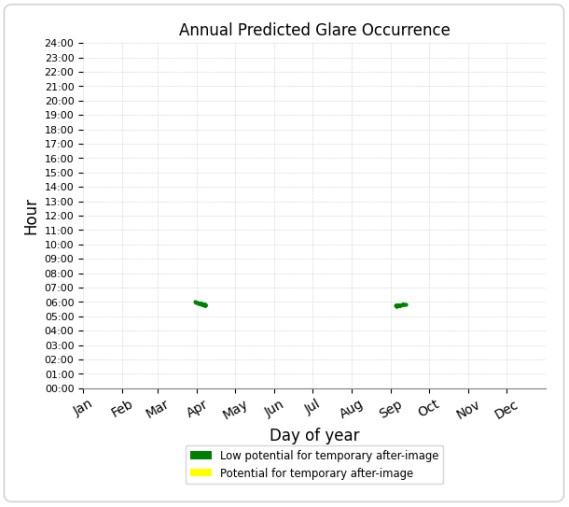


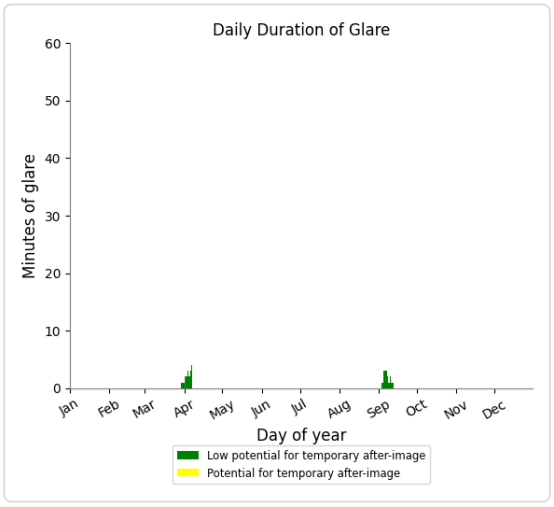


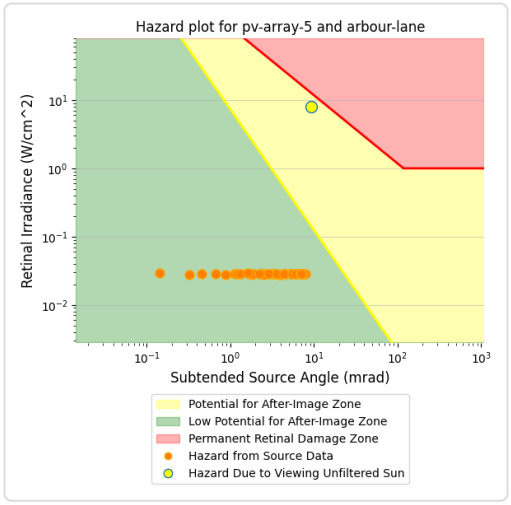
PV array 5 and Route: Arbour lane

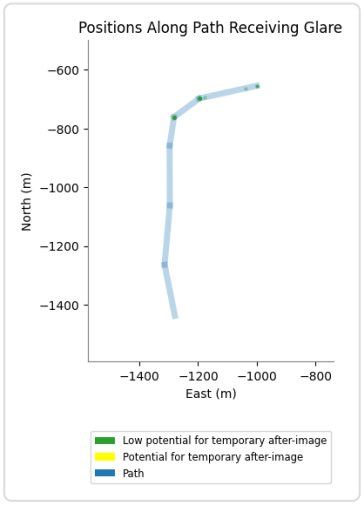
Yellow glare: none

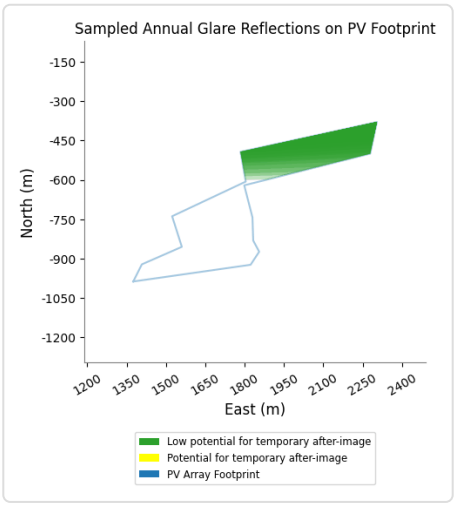
Green glare: 36 min.











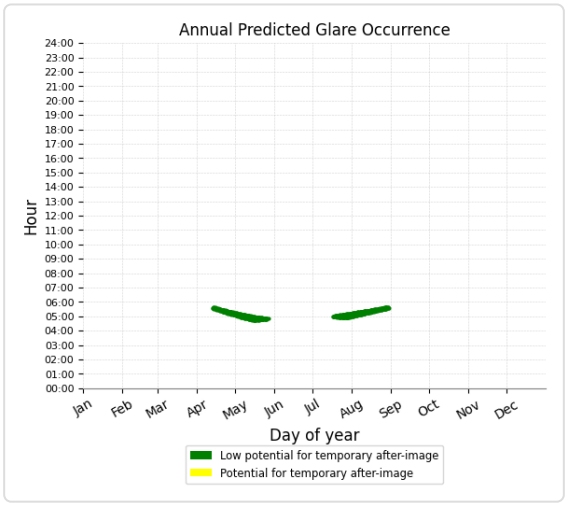
PV array 5 and Route: B6093

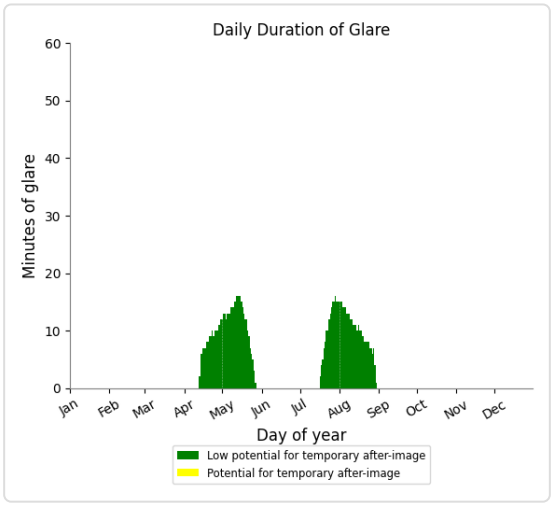
No glare found

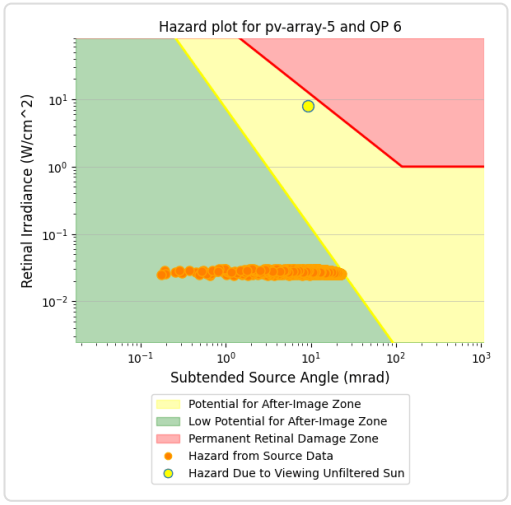
PV array 5 and OP 6

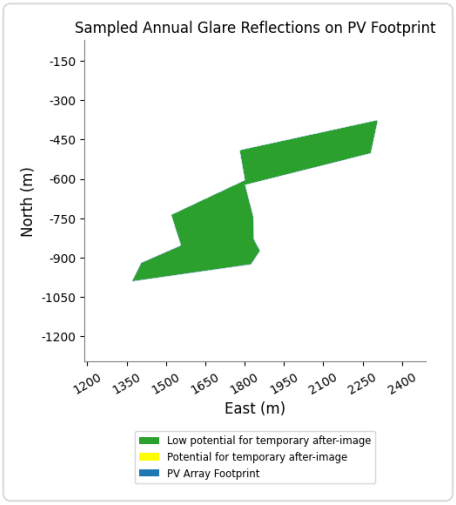
Yellow glare: none

Green glare: 936 min.









PV array 5 and OP 1

No glare found

PV array 5 and OP 2

No glare found

PV array 5 and OP 3

No glare found

PV array 5 and OP 4

No glare found

PV array 5 and OP 5

No glare found

PV array 5 and OP 7

No glare found

PV array 5 and OP 8

No glare found

PV array 5 and OP 9

No glare found

PV array 5 and OP 10

No glare found

PV array 5 and OP 11

No glare found

PV array 5 and OP 12

No glare found

PV array 5 and OP 13

No glare found

PV array 5 and OP 14

No glare found

PV array 5 and OP 15

No glare found

PV array 5 and OP 16

No glare found

PV array 5 and OP 17

No glare found

PV array 5 and OP 18

No glare found

PV array 5 and OP 19

No glare found

PV array 5 and OP 20

No glare found

PV array 5 and OP 21

No glare found

PV array 5 and OP 22

No glare found

PV array 5 and OP 23

No glare found

PV array 5 and OP 24

No glare found

PV array 5 and OP 25

No glare found

PV array 5 and OP 26

No glare found

PV array 5 and OP 27

No glare found

PV array 5 and OP 28

No glare found

PV array 5 and OP 29

No glare found

PV array 5 and OP 30

No glare found

PV array 5 and OP 31

No glare found

PV array 5 and OP 32

No glare found

PV array 5 and OP 33

No glare found

PV array 5 and OP 34

No glare found

PV array 5 and OP 35

No glare found

PV array 5 and OP 36

No glare found

PV array 5 and OP 37

No glare found

PV array 5 and OP 38

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page [redacted] or assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 1**
Site configuration: **W1**

Created 23 Jun, 2025
Updated 23 Jun, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 500 kW to 1 MW
Site ID 152689.25566

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	23,361	389.4	28,546	475.8	-
PV array 2	25.0	180.0	231,146	3,852.4	63,272	1,054.5	-
PV array 3	25.0	180.0	15,311	255.2	6,685	111.4	-
PV array 4	25.0	180.0	9,227	153.8	7,074	117.9	-
PV array 5	25.0	180.0	5,311	88.5	17,280	288.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

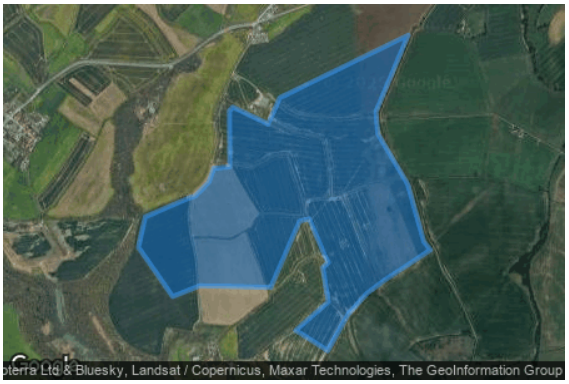
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	4,856	80.9	2,927	48.8
B6093	0	0.0	0	0.0
B6094 and Ruddle Lane	5,731	95.5	14,447	240.8
M18	9,201	153.3	12,931	215.5
OP 1	1,102	18.4	527	8.8
OP 2	886	14.8	1,455	24.2
OP 3	884	14.7	1,792	29.9
OP 4	302	5.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	1,797	29.9	2,432	40.5
OP 7	4,912	81.9	2,142	35.7

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 8	2,918	48.6	3,638	60.6
OP 9	2,508	41.8	3,923	65.4
OP 10	2,298	38.3	1,263	21.1
OP 11	1,833	30.6	1,782	29.7
OP 12	1,913	31.9	1,256	20.9
OP 13	1,038	17.3	479	8.0
OP 14	909	15.2	292	4.9
OP 15	831	13.8	132	2.2
OP 16	795	13.2	27	0.5
OP 17	500	8.3	4,436	73.9
OP 18	638	10.6	56	0.9
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	1,649	27.5	2,525	42.1
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	317	5.3	0	0.0
OP 27	37	0.6	0	0.0
OP 28	0	0.0	0	0.0
OP 29	2,660	44.3	6,311	105.2
OP 30	4,066	67.8	7,896	131.6
OP 31	4,164	69.4	6,600	110.0
OP 32	2,614	43.6	2,996	49.9
OP 33	212,670	3,544.5	24,078	401.3
OP 34	0	0.0	0	0.0
OP 35	1,299	21.6	0	0.0
OP 36	815	13.6	1,768	29.5
OP 37	4,722	78.7	6,853	114.2
OP 38	3,491	58.2	7,893	131.6

Component Data

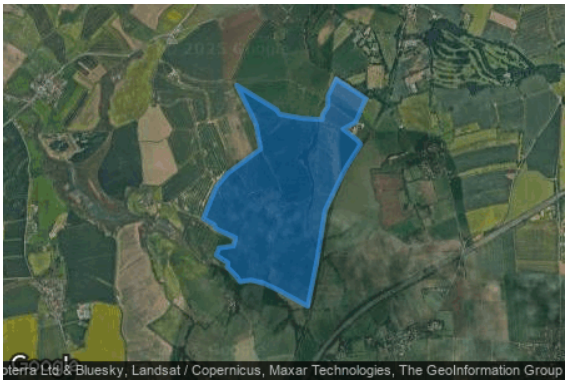
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.462880	-1.242763	80.56	3.80	84.36
2	53.461615	-1.245982	76.28	3.80	80.08
3	53.461117	-1.247097	70.69	3.80	74.49
4	53.460248	-1.248428	70.12	3.80	73.92
5	53.458766	-1.249812	78.74	3.80	82.54
6	53.459596	-1.252011	72.18	3.80	75.98
7	53.460759	-1.249780	66.63	3.80	70.43
8	53.462151	-1.250155	67.45	3.80	71.25
9	53.462362	-1.249769	66.25	3.80	70.05
10	53.462650	-1.250026	64.95	3.80	68.75
11	53.464150	-1.251099	66.68	3.80	70.48
12	53.464047	-1.251754	66.15	3.80	69.95
13	53.461346	-1.253738	60.64	3.80	64.44
14	53.461416	-1.258599	63.51	3.80	67.31
15	53.460975	-1.260476	67.22	3.80	71.02
16	53.462983	-1.262831	82.20	3.80	86.00
17	53.464219	-1.262370	83.30	3.80	87.10
18	53.464950	-1.259516	81.07	3.80	84.87
19	53.465077	-1.258915	80.55	3.80	84.35
20	53.465639	-1.257976	79.05	3.80	82.85
21	53.466204	-1.257649	78.43	3.80	82.23
22	53.466262	-1.256555	76.62	3.80	80.42
23	53.468550	-1.256575	78.54	3.80	82.34
24	53.468697	-1.256344	78.47	3.80	82.27
25	53.468007	-1.253919	78.06	3.80	81.86
26	53.469079	-1.253110	78.94	3.80	82.74
27	53.471629	-1.244293	77.03	3.80	80.83
28	53.468512	-1.246508	83.61	3.80	87.41
29	53.467605	-1.246379	82.68	3.80	86.48
30	53.465556	-1.244326	78.32	3.80	82.12
31	53.463205	-1.243211	79.61	3.80	83.41

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451858	-1.242251	76.11	3.80	79.91
2	53.452101	-1.243817	77.04	3.80	80.84
3	53.451968	-1.245330	76.43	3.80	80.23
4	53.452365	-1.245780	77.09	3.80	80.89
5	53.453157	-1.247089	73.78	3.80	77.58
6	53.453508	-1.247014	77.59	3.80	81.39
7	53.454133	-1.248632	80.83	3.80	84.63
8	53.454727	-1.248246	84.63	3.80	88.43
9	53.454880	-1.246271	89.25	3.80	93.05
10	53.455544	-1.245960	90.29	3.80	94.09
11	53.456142	-1.248170	86.92	3.80	90.72
12	53.456356	-1.248750	83.99	3.80	87.79
13	53.456595	-1.248900	83.63	3.80	87.43
14	53.457132	-1.250386	76.72	3.80	80.52
15	53.459695	-1.248626	72.62	3.80	76.42
16	53.460821	-1.247009	71.43	3.80	75.23
17	53.462776	-1.242546	80.51	3.80	84.31
18	53.464717	-1.243104	76.12	3.80	79.92
19	53.465886	-1.244037	77.30	3.80	81.10
20	53.467981	-1.245797	82.49	3.80	86.29
21	53.465982	-1.240304	65.83	3.80	69.63
22	53.465631	-1.239928	65.43	3.80	69.23
23	53.465299	-1.236903	62.51	3.80	66.31
24	53.465190	-1.234070	62.94	3.80	66.74
25	53.465573	-1.234006	62.06	3.80	65.86
26	53.466250	-1.233276	60.38	3.80	64.18
27	53.467151	-1.233244	57.86	3.80	61.66
28	53.468498	-1.232139	55.87	3.80	59.67
29	53.466900	-1.228049	68.84	3.80	72.64
30	53.464957	-1.229472	73.49	3.80	77.29
31	53.464421	-1.231172	72.35	3.80	76.15
32	53.464012	-1.230260	76.51	3.80	80.31
33	53.463498	-1.229219	81.20	3.80	85.00
34	53.463171	-1.228764	83.82	3.80	87.62
35	53.461159	-1.230909	82.34	3.80	86.14
36	53.457824	-1.233656	80.93	3.80	84.73
37	53.454042	-1.234665	90.93	3.80	94.73
38	53.449966	-1.236038	95.95	3.80	99.75
39	53.451282	-1.240093	81.62	3.80	85.42
40	53.451947	-1.242432	76.68	3.80	80.48

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465402	-1.224873	79.16	3.80	82.96
2	53.464182	-1.223639	86.47	3.80	90.27
3	53.463831	-1.223800	88.04	3.80	91.84
4	53.463365	-1.223832	90.80	3.80	94.60
5	53.462553	-1.223071	99.58	3.80	103.38
6	53.462336	-1.225077	95.12	3.80	98.92
7	53.461883	-1.225410	97.71	3.80	101.51
8	53.463959	-1.226901	83.06	3.80	86.86
9	53.465198	-1.225764	78.40	3.80	82.20

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461091	-1.227555	95.91	3.80	99.71
2	53.461116	-1.230044	85.68	3.80	89.48
3	53.459289	-1.231418	86.76	3.80	90.56
4	53.458484	-1.232072	86.56	3.80	90.36
5	53.457366	-1.232458	86.26	3.80	90.06
6	53.455504	-1.233220	87.78	3.80	91.58
7	53.455881	-1.231289	90.04	3.80	93.84
8	53.457031	-1.228800	97.29	3.80	101.09
9	53.456833	-1.228542	98.43	3.80	102.23
10	53.455625	-1.231064	90.87	3.80	94.67
11	53.455248	-1.233231	88.13	3.80	91.93
12	53.454096	-1.233596	89.82	3.80	93.62
13	53.454409	-1.232330	89.95	3.80	93.75
14	53.454301	-1.230538	93.43	3.80	97.23
15	53.455464	-1.228188	98.37	3.80	102.17
16	53.456651	-1.226227	103.50	3.80	107.30
17	53.457615	-1.226302	104.49	3.80	108.29
18	53.457890	-1.226034	105.77	3.80	109.57
19	53.458637	-1.226806	103.66	3.80	107.46
20	53.460013	-1.227390	98.67	3.80	102.47

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454007	-1.222055	116.69	3.80	120.49
2	53.454582	-1.215318	126.87	3.80	130.67
3	53.455030	-1.214824	128.17	3.80	131.97
4	53.455413	-1.215167	129.91	3.80	133.71
5	53.456205	-1.215210	132.14	3.80	135.94
6	53.457304	-1.215682	132.18	3.80	135.98
7	53.458390	-1.208451	120.42	3.80	124.22
8	53.459476	-1.208065	122.00	3.80	125.80
9	53.458454	-1.215897	130.66	3.80	134.46
10	53.457432	-1.215597	131.67	3.80	135.47
11	53.456243	-1.219824	133.91	3.80	137.71
12	53.455196	-1.219266	129.10	3.80	132.90
13	53.454595	-1.221562	118.02	3.80	121.82

Route Receptors

Name: Arbour lane
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.456997	-1.257824	53.70	1.50	55.20
2	53.456608	-1.260774	59.79	1.50	61.29
3	53.456039	-1.262062	66.70	1.50	68.20
4	53.455164	-1.262287	70.36	1.50	71.86
5	53.453337	-1.262276	78.13	1.50	79.63
6	53.451522	-1.262544	84.32	1.50	85.82
7	53.449963	-1.262019	91.94	1.50	93.44

Name: B6093
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465900	-1.277251	25.03	1.50	26.53
2	53.464309	-1.275760	43.86	1.50	45.36
3	53.462703	-1.274419	48.22	1.50	49.72
4	53.460774	-1.274226	61.75	1.50	63.25
5	53.458979	-1.274312	69.22	1.50	70.72
6	53.457196	-1.274516	80.65	1.50	82.15

Name: B6094 and Ruddle Lane
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.450516	-1.201218	110.37	1.50	111.87
2	53.452339	-1.201293	109.28	1.50	110.78
3	53.454108	-1.201507	108.83	1.50	110.33
4	53.455916	-1.201411	108.68	1.50	110.18
5	53.457762	-1.201432	107.92	1.50	109.42
6	53.459532	-1.201690	110.09	1.50	111.59
7	53.461378	-1.201636	108.02	1.50	109.52
8	53.463173	-1.201293	106.19	1.50	107.69
9	53.464949	-1.201239	107.00	1.50	108.50
10	53.466635	-1.201196	105.73	1.50	107.23
11	53.465038	-1.202720	108.00	1.50	109.50
12	53.463620	-1.204511	113.16	1.50	114.66
13	53.461995	-1.206048	116.19	1.50	117.69
14	53.460392	-1.207561	120.42	1.50	121.92
15	53.458629	-1.208183	120.77	1.50	122.27
16	53.456853	-1.209170	120.96	1.50	122.46
17	53.455971	-1.211938	126.81	1.50	128.31
18	53.455007	-1.214363	127.54	1.50	129.04
19	53.453213	-1.215180	125.85	1.50	127.35
20	53.451578	-1.216263	124.31	1.50	125.81
21	53.449923	-1.217583	126.30	1.50	127.80
22	53.448472	-1.219503	128.07	1.50	129.57
23	53.447615	-1.222261	133.30	1.50	134.80
24	53.447059	-1.225179	133.91	1.50	135.41
25	53.447263	-1.228140	126.60	1.50	128.10
26	53.446637	-1.230994	124.19	1.50	125.69
27	53.445161	-1.231878	121.18	1.50	122.68
28	53.443356	-1.232844	117.32	1.50	118.82
29	53.442416	-1.235698	117.95	1.50	119.45

Name: M18
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461569	-1.193905	98.74	1.50	100.24
2	53.460610	-1.196479	100.16	1.50	101.66
3	53.459684	-1.199097	103.14	1.50	104.64
4	53.458739	-1.201737	110.09	1.50	111.59
5	53.457768	-1.204333	112.45	1.50	113.95
6	53.456886	-1.206951	116.05	1.50	117.55
7	53.456026	-1.209472	120.40	1.50	121.90
8	53.455202	-1.212133	125.07	1.50	126.57
9	53.454282	-1.214826	126.44	1.50	127.94
10	53.453400	-1.217401	125.13	1.50	126.63
11	53.452442	-1.219954	123.40	1.50	124.90
12	53.451611	-1.222669	114.26	1.50	115.76
13	53.450800	-1.225340	109.57	1.50	111.07
14	53.449805	-1.227906	107.01	1.50	108.51
15	53.448616	-1.230320	107.85	1.50	109.35
16	53.447325	-1.232507	111.80	1.50	113.30
17	53.445920	-1.234342	110.47	1.50	111.97
18	53.444336	-1.236048	108.28	1.50	109.78
19	53.442720	-1.237453	115.83	1.50	117.33
20	53.440988	-1.238398	114.56	1.50	116.06

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.447346	-1.225228	130.28	2.00
OP 2	2	53.447696	-1.222640	131.62	2.00
OP 3	3	53.448207	-1.220767	129.44	1.00
OP 4	4	53.447102	-1.228042	128.71	2.00
OP 5	5	53.447096	-1.230963	119.98	2.00
OP 6	6	53.450085	-1.245769	81.12	2.00
OP 7	7	53.457352	-1.256496	57.41	2.00
OP 8	8	53.458441	-1.257671	62.61	2.00
OP 9	9	53.458968	-1.257510	60.41	2.00
OP 10	10	53.457233	-1.273775	80.62	2.00
OP 11	11	53.464212	-1.273918	36.59	2.00
OP 12	12	53.463331	-1.279609	37.25	2.00
OP 13	13	53.466445	-1.273504	27.94	2.00
OP 14	14	53.466959	-1.272898	34.41	2.00
OP 15	15	53.467557	-1.271718	41.69	2.00
OP 16	16	53.467943	-1.271316	43.59	2.00
OP 17	17	53.468714	-1.254014	78.61	2.00
OP 18	18	53.470084	-1.255923	79.70	2.00
OP 19	19	53.471932	-1.254933	81.65	2.00
OP 20	20	53.472681	-1.253425	81.78	2.00
OP 21	21	53.471893	-1.240549	67.35	2.00
OP 22	22	53.467672	-1.236220	60.06	2.00
OP 23	23	53.472336	-1.229046	51.45	2.00
OP 24	24	53.471731	-1.228818	53.11	2.00
OP 25	25	53.470999	-1.226730	57.51	2.00
OP 26	26	53.468990	-1.219413	79.68	2.00
OP 27	27	53.470868	-1.219660	76.09	2.00
OP 28	28	53.471372	-1.220378	71.75	2.00
OP 29	29	53.463332	-1.219528	104.16	2.00
OP 30	30	53.461823	-1.220090	122.40	2.00
OP 31	31	53.460761	-1.219003	129.25	2.00
OP 32	32	53.451241	-1.217211	126.38	2.00
OP 33	33	53.457404	-1.239851	86.39	2.00
OP 34	34	53.442150	-1.241126	113.46	2.00
OP 35	35	53.467953	-1.207806	114.31	2.00
OP 36	36	53.448072	-1.218610	129.05	2.00
OP 37	37	53.461153	-1.219963	128.19	2.00
OP 38	38	53.462146	-1.220344	116.96	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	23,361	389.4	28,546	475.8	-
PV array 2	25.0	180.0	231,146	3,852.4	63,272	1,054.5	-
PV array 3	25.0	180.0	15,311	255.2	6,685	111.4	-
PV array 4	25.0	180.0	9,227	153.8	7,074	117.9	-
PV array 5	25.0	180.0	5,311	88.5	17,280	288.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	4,856	80.9	2,927	48.8
B6093	0	0.0	0	0.0
B6094 and Ruddle Lane	5,731	95.5	14,447	240.8
M18	9,201	153.3	12,931	215.5
OP 1	1,102	18.4	527	8.8
OP 2	886	14.8	1,455	24.2
OP 3	884	14.7	1,792	29.9
OP 4	302	5.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	1,797	29.9	2,432	40.5
OP 7	4,912	81.9	2,142	35.7
OP 8	2,918	48.6	3,638	60.6
OP 9	2,508	41.8	3,923	65.4
OP 10	2,298	38.3	1,263	21.1
OP 11	1,833	30.6	1,782	29.7
OP 12	1,913	31.9	1,256	20.9
OP 13	1,038	17.3	479	8.0
OP 14	909	15.2	292	4.9
OP 15	831	13.8	132	2.2
OP 16	795	13.2	27	0.5
OP 17	500	8.3	4,436	73.9
OP 18	638	10.6	56	0.9
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	1,649	27.5	2,525	42.1
OP 23	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	317	5.3	0	0.0
OP 27	37	0.6	0	0.0
OP 28	0	0.0	0	0.0
OP 29	2,660	44.3	6,311	105.2
OP 30	4,066	67.8	7,896	131.6
OP 31	4,164	69.4	6,600	110.0
OP 32	2,614	43.6	2,996	49.9
OP 33	212,670	3,544.5	24,078	401.3
OP 34	0	0.0	0	0.0
OP 35	1,299	21.6	0	0.0
OP 36	815	13.6	1,768	29.5
OP 37	4,722	78.7	6,853	114.2
OP 38	3,491	58.2	7,893	131.6

PV: PV array 1 potential temporary after-image

Receptor results ordered by category of glare

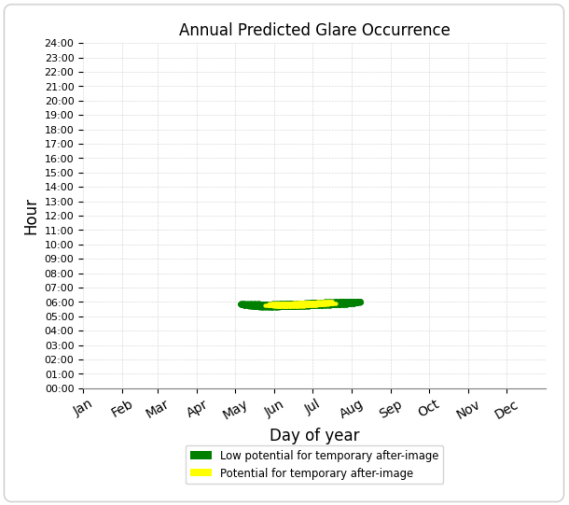
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	1,301	21.7	663	11.1
B6094 and Ruddle Lane	754	12.6	1,884	31.4
M18	2,535	42.2	295	4.9
B6093	0	0.0	0	0.0
OP 7	1,775	29.6	84	1.4
OP 8	776	12.9	2,077	34.6
OP 9	655	10.9	2,296	38.3
OP 11	1,159	19.3	1,782	29.7
OP 12	1,154	19.2	1,256	20.9
OP 13	882	14.7	479	8.0
OP 14	841	14.0	292	4.9
OP 15	809	13.5	132	2.2
OP 16	795	13.2	27	0.5
OP 17	481	8.0	4,436	73.9
OP 18	638	10.6	56	0.9
OP 22	585	9.8	2,282	38.0
OP 29	1,391	23.2	1,093	18.2
OP 30	1,049	17.5	1,950	32.5
OP 31	923	15.4	2,235	37.2
OP 32	1,021	17.0	195	3.2
OP 33	700	11.7	992	16.5
OP 37	892	14.9	2,276	37.9
OP 38	1,089	18.1	1,764	29.4
OP 26	317	5.3	0	0.0
OP 27	37	0.6	0	0.0
OP 35	802	13.4	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 23	0	0.0	0	0.0

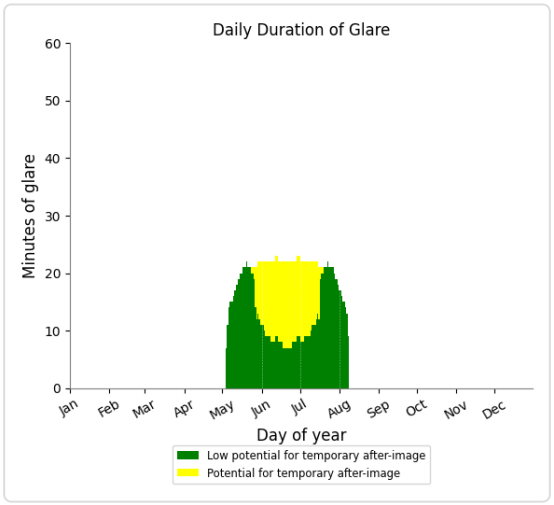
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 36	0	0.0	0	0.0

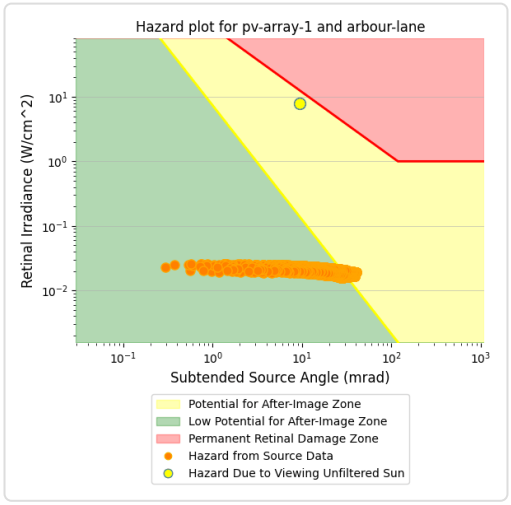
PV array 1 and Route: Arbour lane

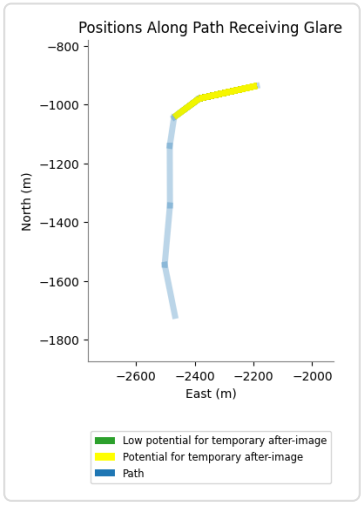
Yellow glare: 663 min.

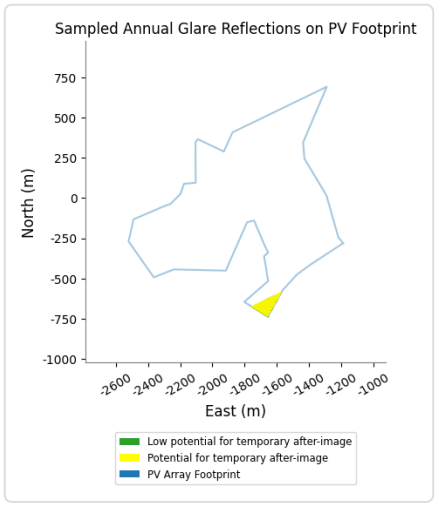
Green glare: 1,301 min.







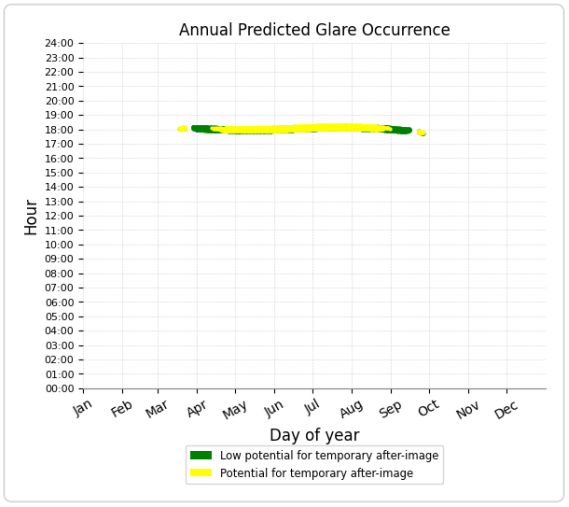


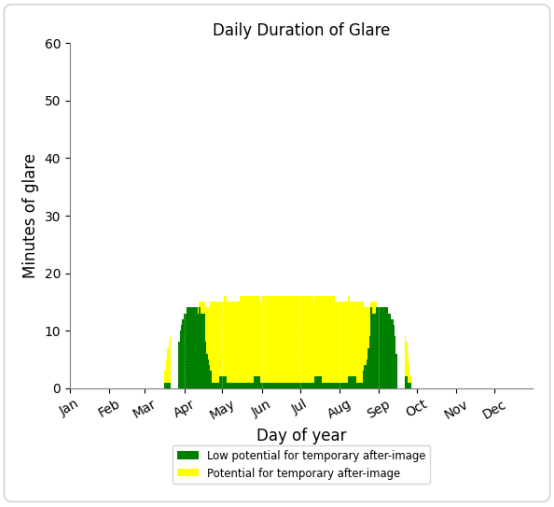


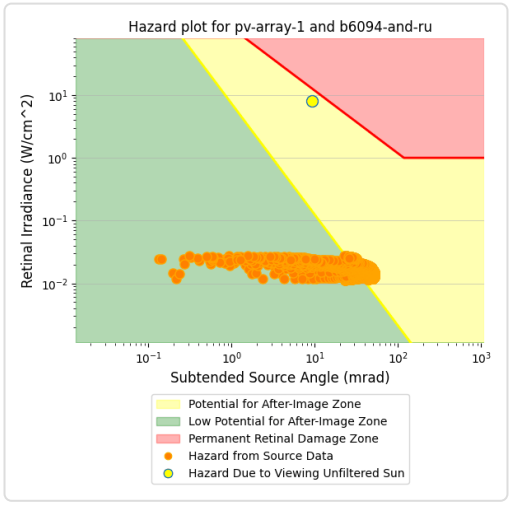
PV array 1 and Route: B6094 and Ruddle Lane

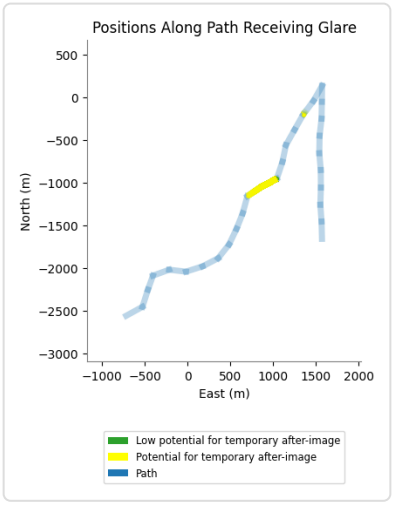
Yellow glare: 1,884 min.

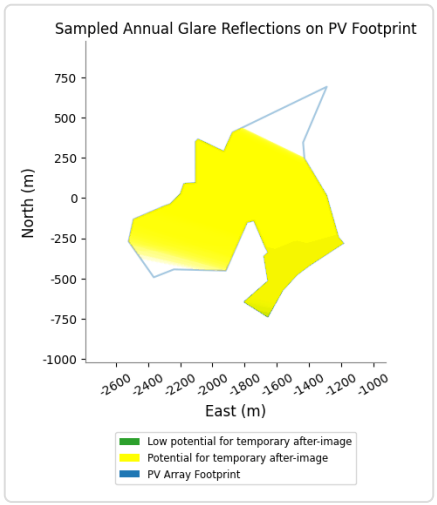
Green glare: 754 min.







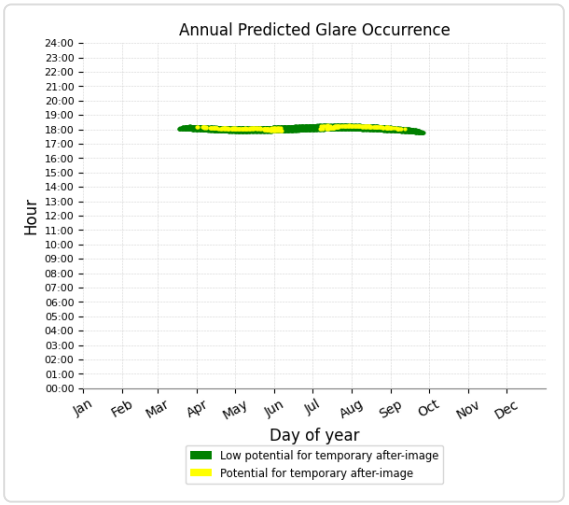


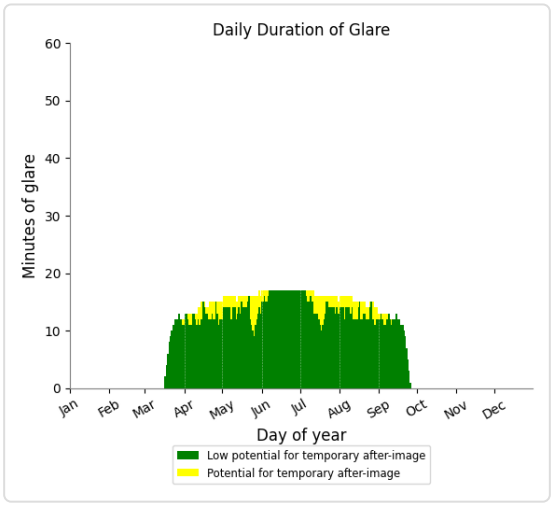


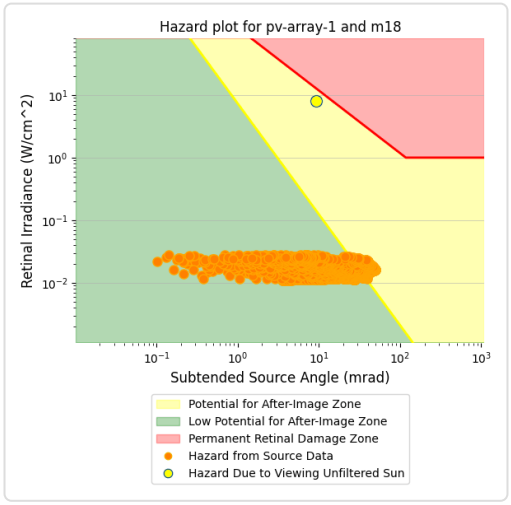
PV array 1 and Route: M18

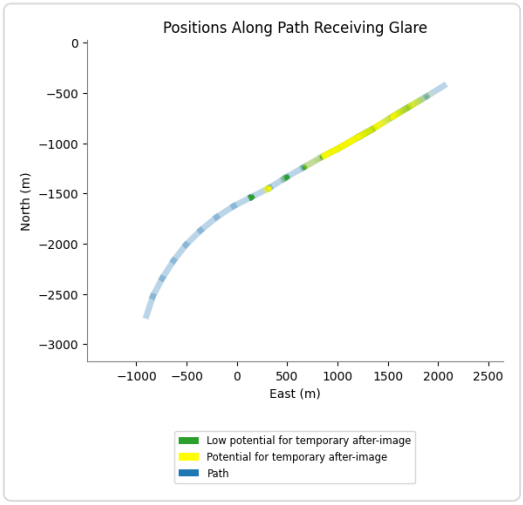
Yellow glare: 295 min.

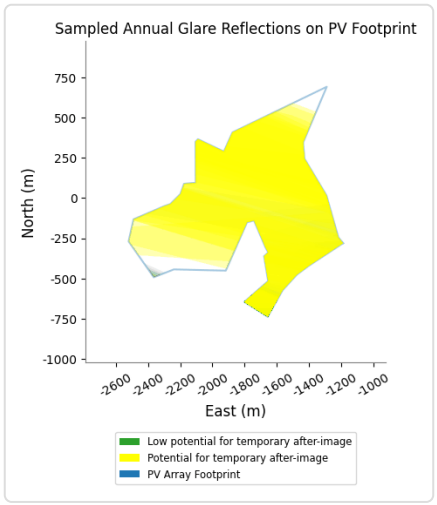
Green glare: 2,535 min.











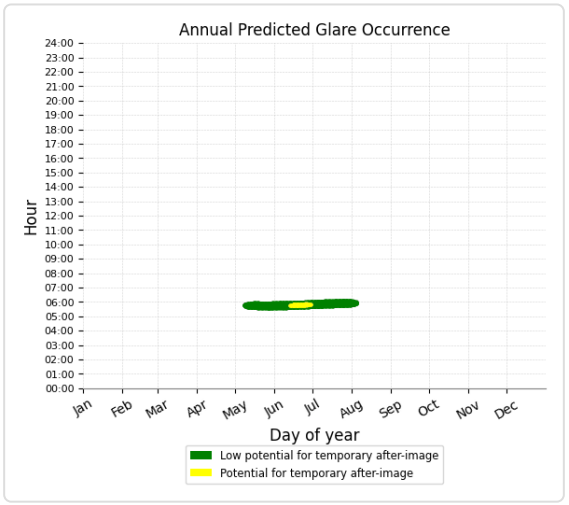
PV array 1 and Route: B6093

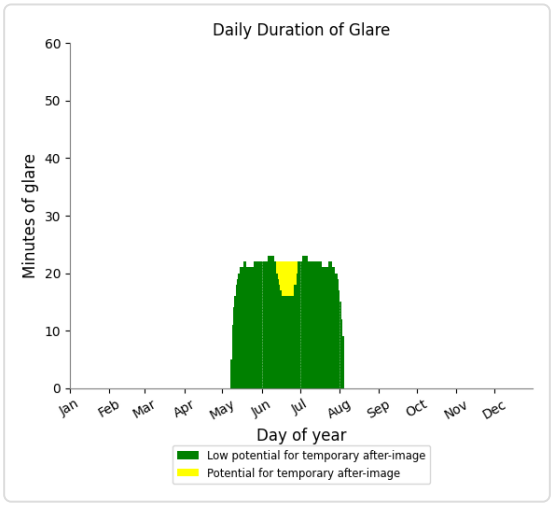
No glare found

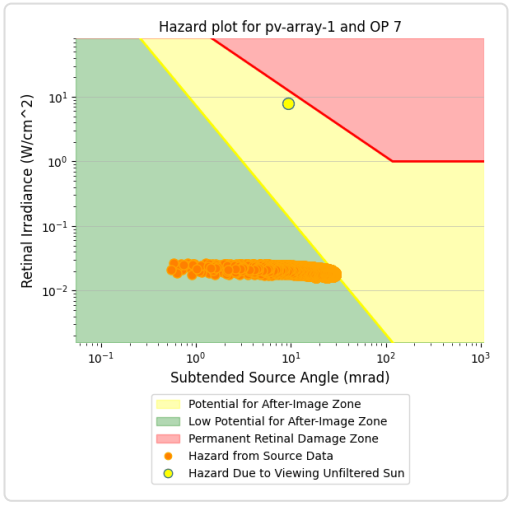
PV array 1 and OP 7

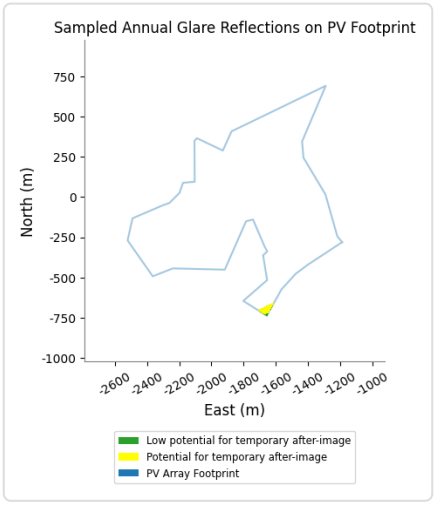
Yellow glare: 84 min.

Green glare: 1,775 min.





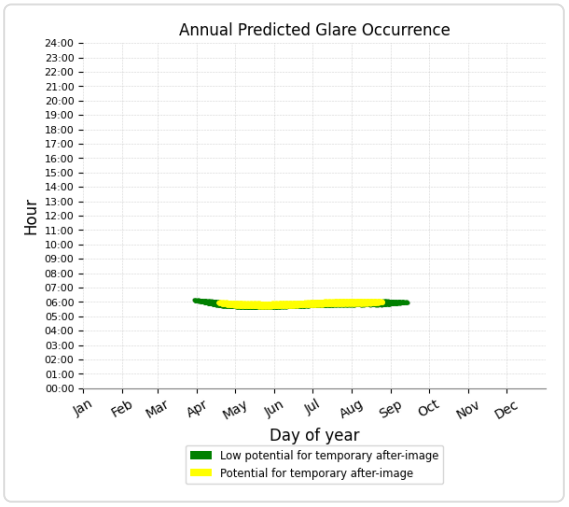


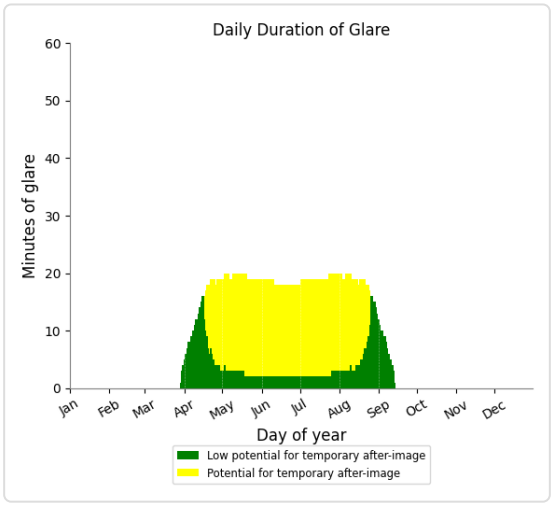


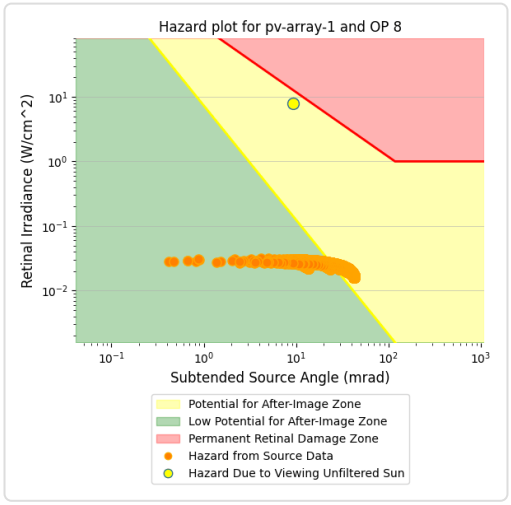
PV array 1 and OP 8

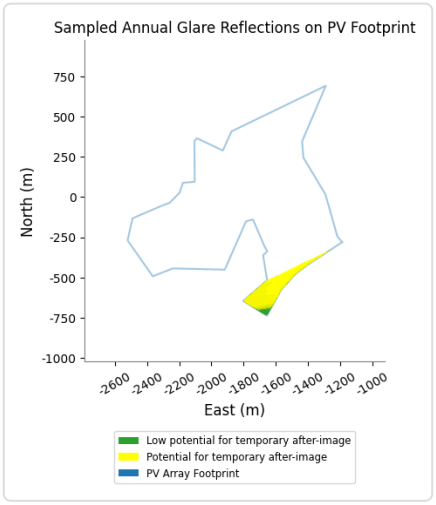
Yellow glare: 2,077 min.

Green glare: 776 min.





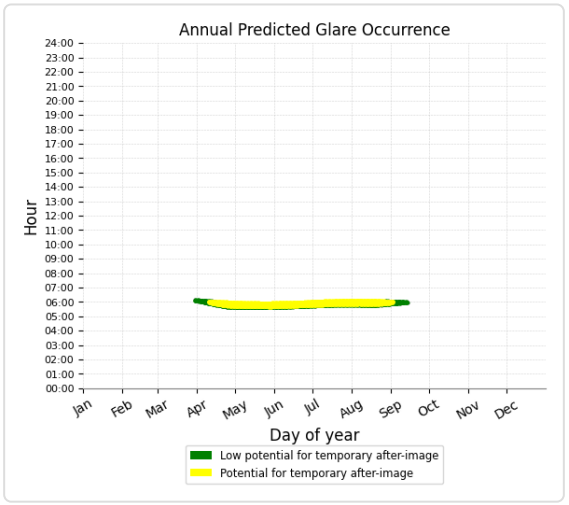


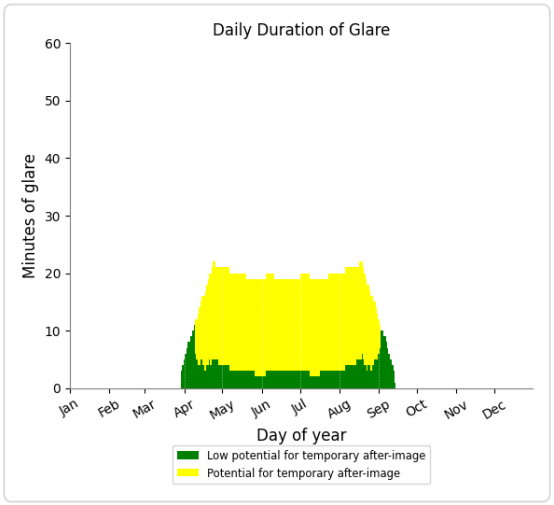


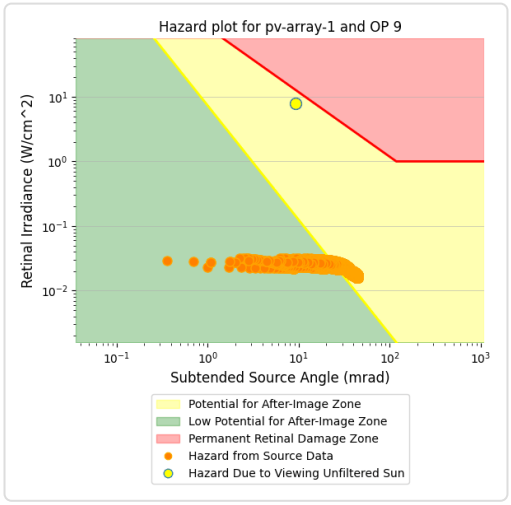
PV array 1 and OP 9

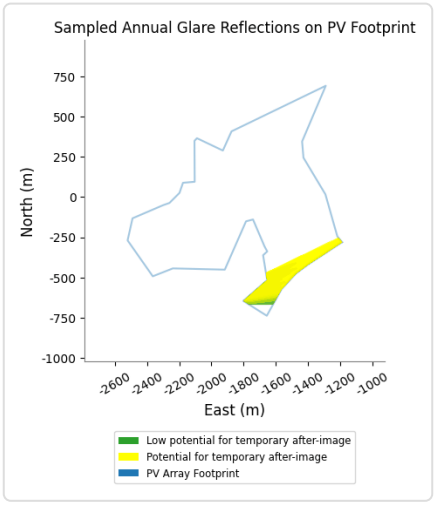
Yellow glare: 2,296 min.

Green glare: 655 min.





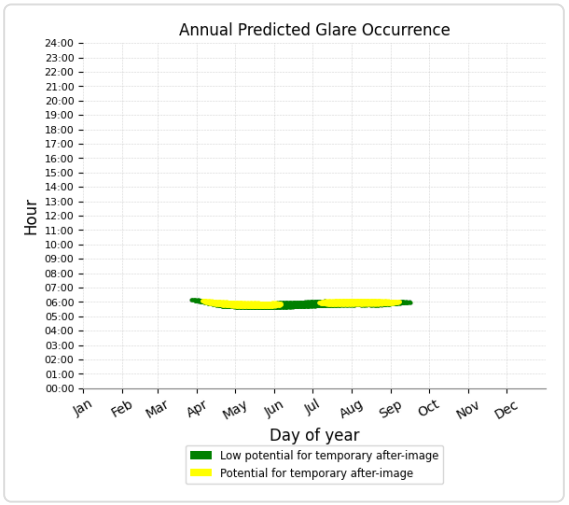


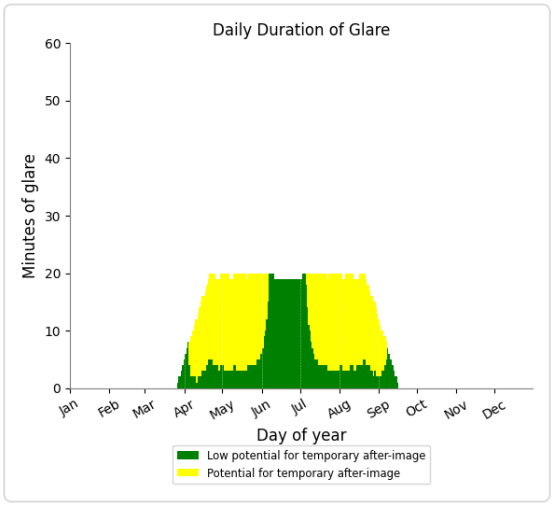


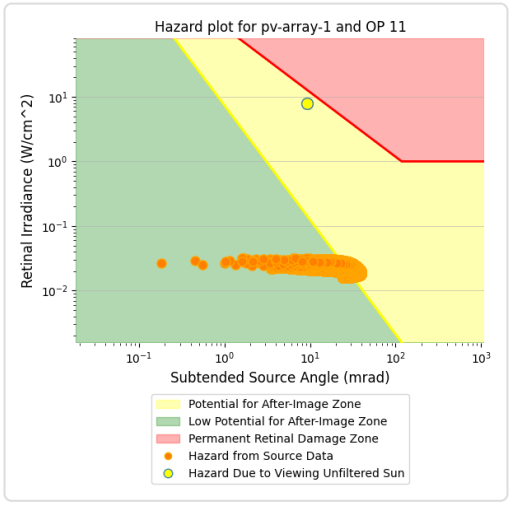
PV array 1 and OP 11

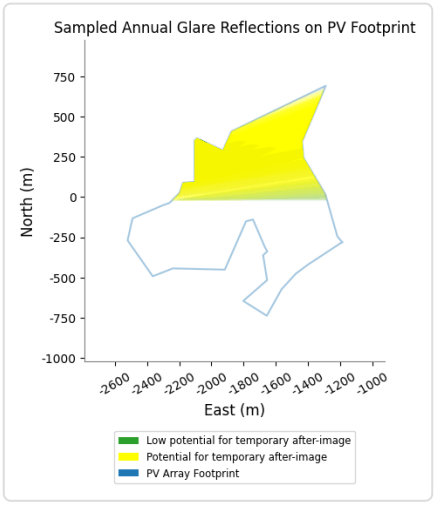
Yellow glare: 1,782 min.

Green glare: 1,159 min.





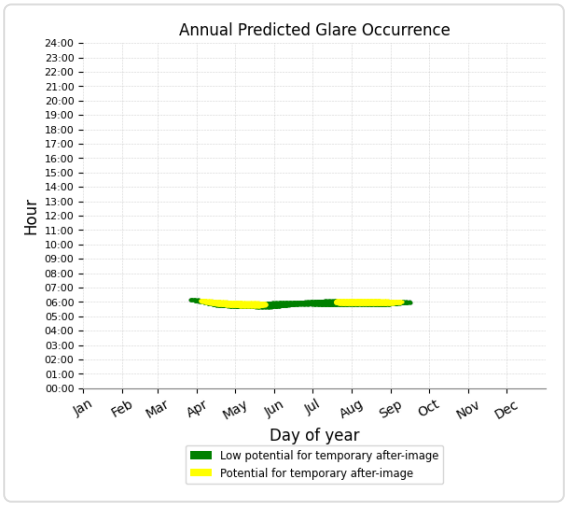


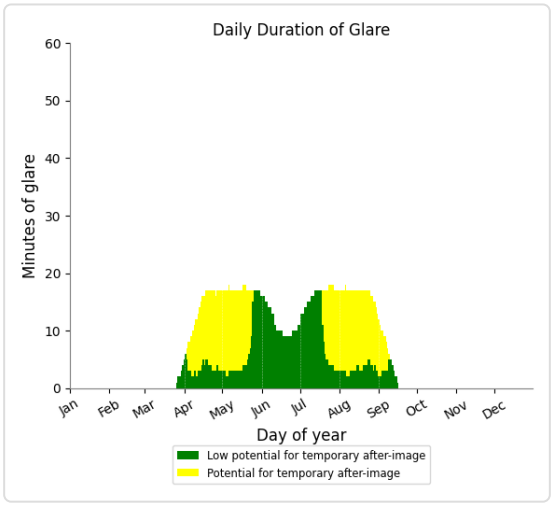


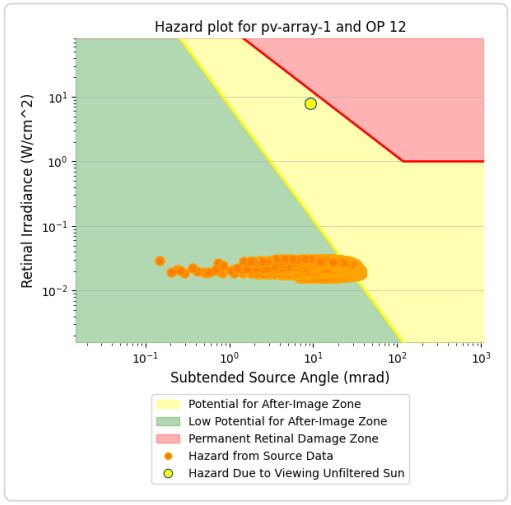
PV array 1 and OP 12

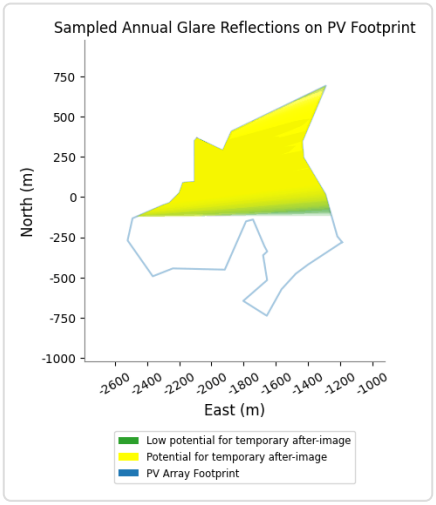
Yellow glare: 1,256 min.

Green glare: 1,154 min.





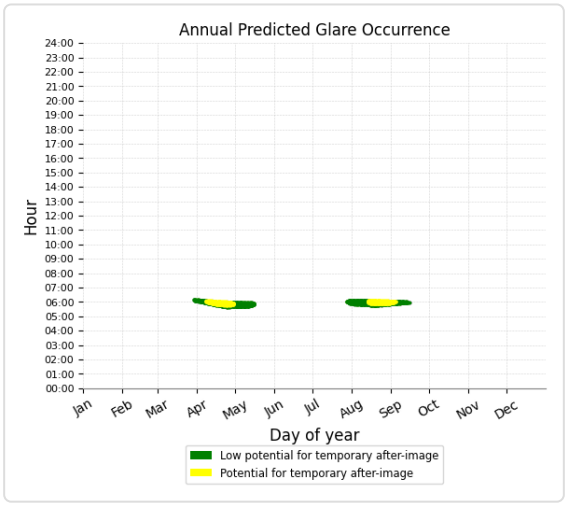


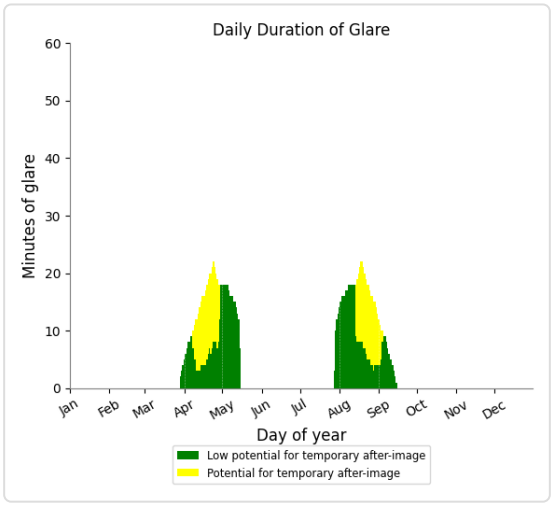


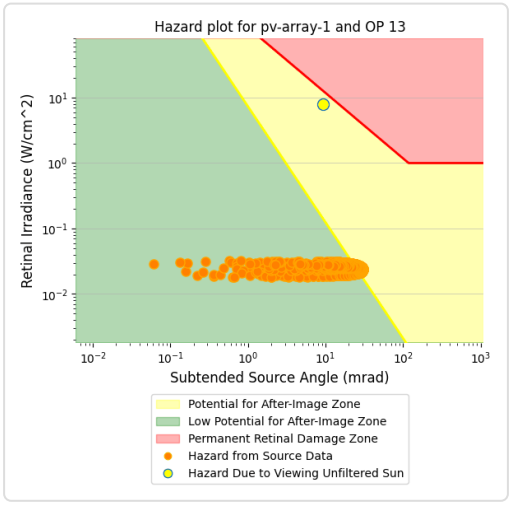
PV array 1 and OP 13

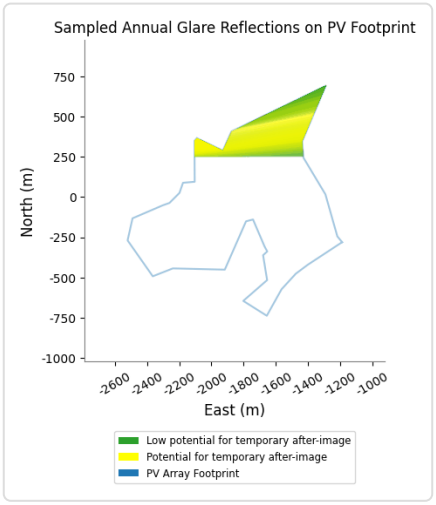
Yellow glare: 479 min.

Green glare: 882 min.





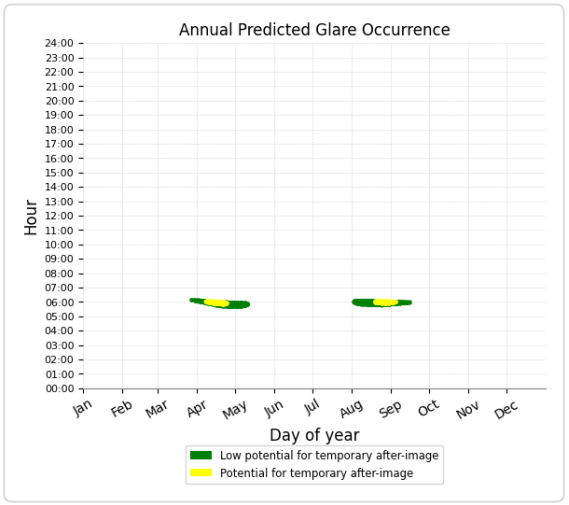


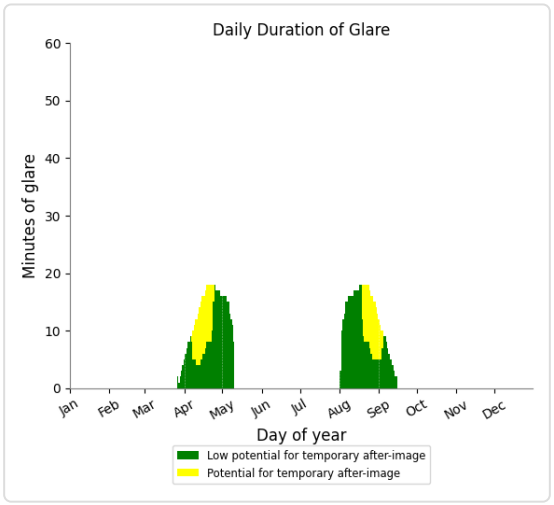


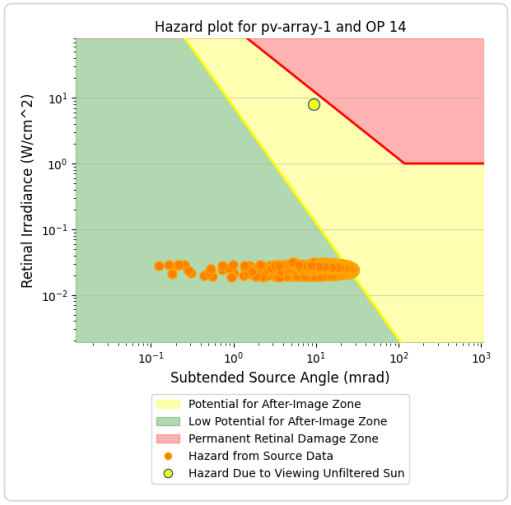
PV array 1 and OP 14

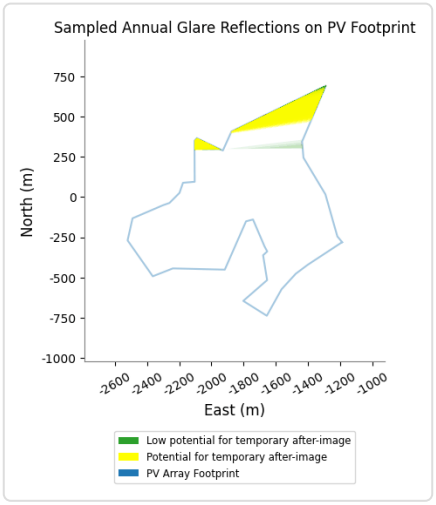
Yellow glare: 292 min.

Green glare: 841 min.





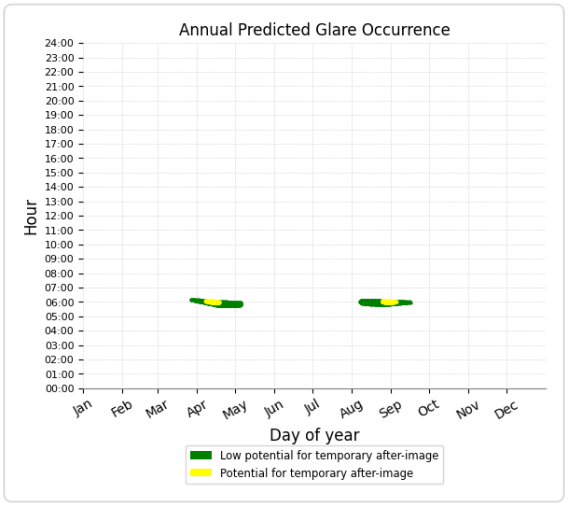


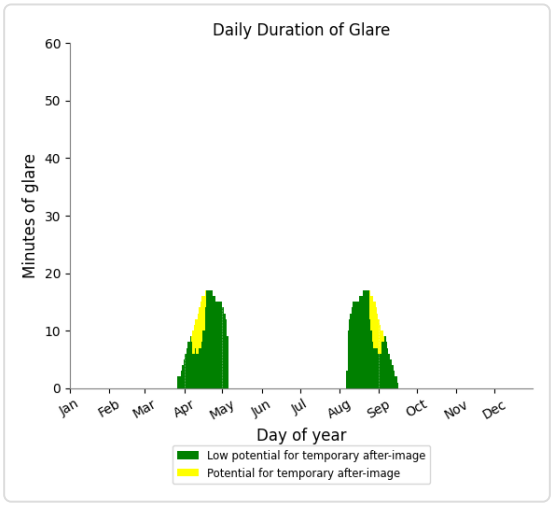


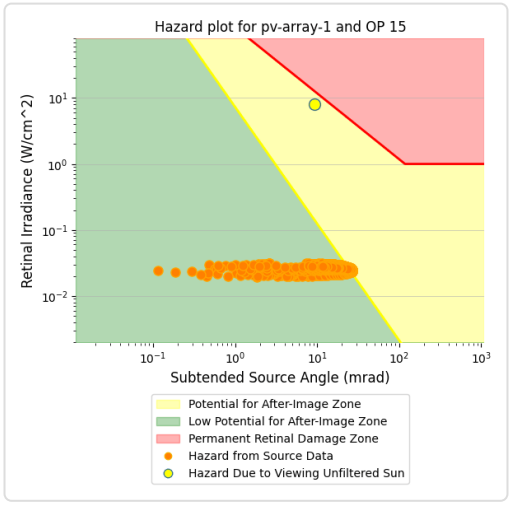
PV array 1 and OP 15

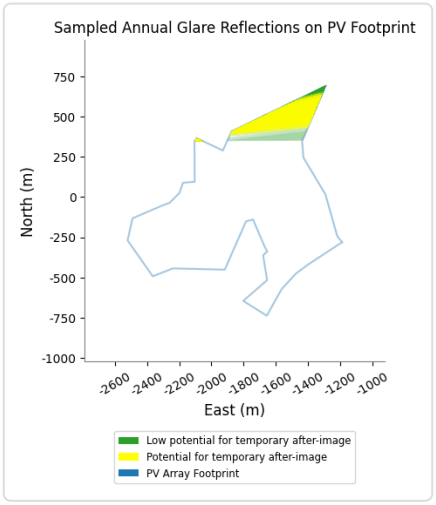
Yellow glare: 132 min.

Green glare: 809 min.





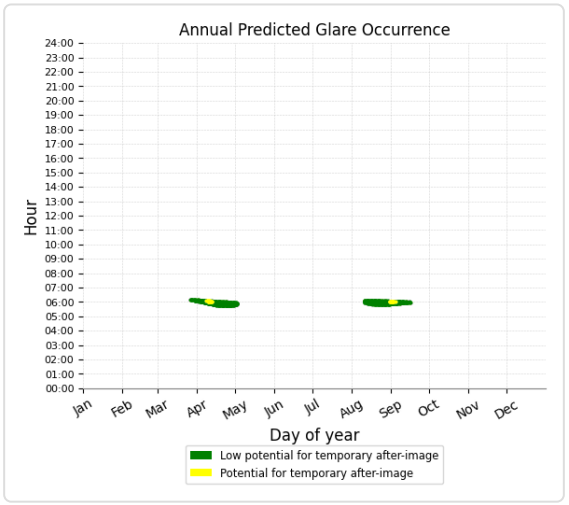


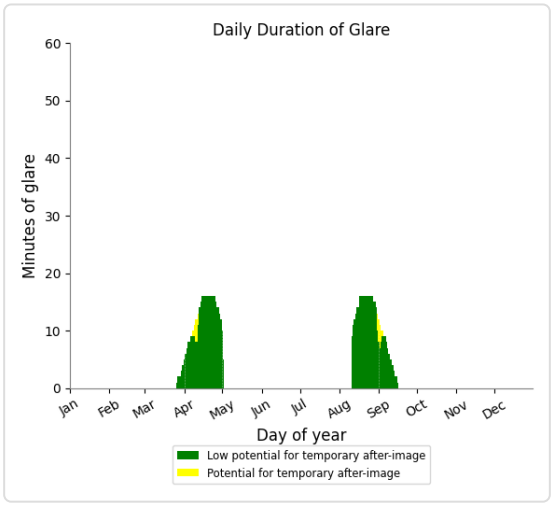


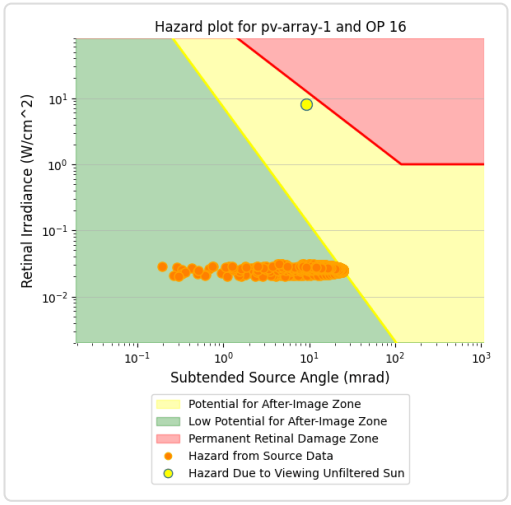
PV array 1 and OP 16

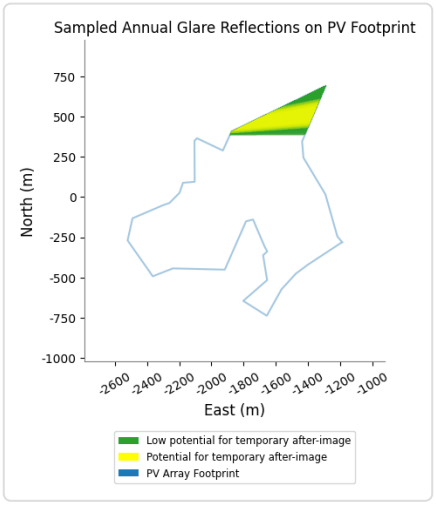
Yellow glare: 27 min.

Green glare: 795 min.





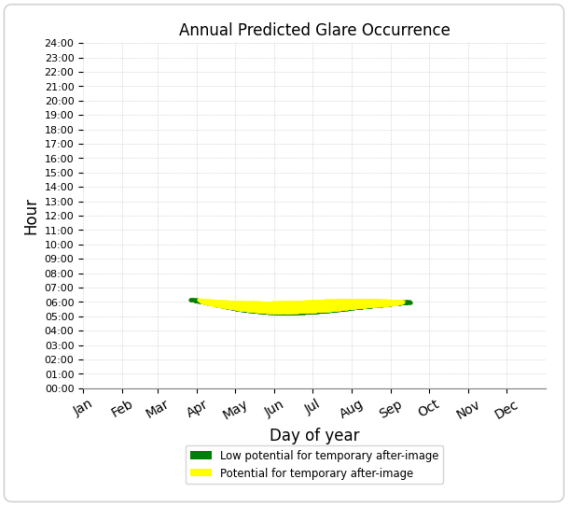


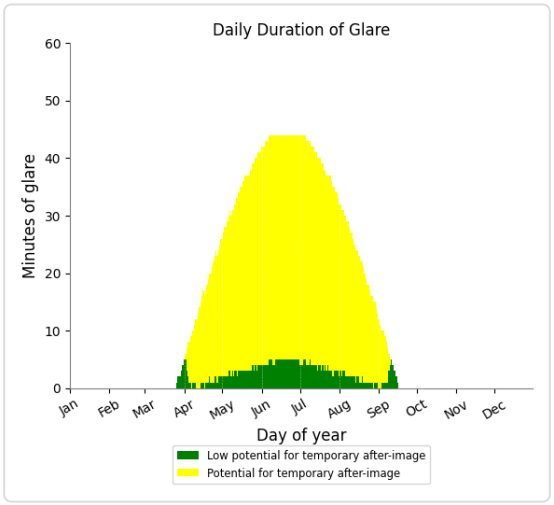


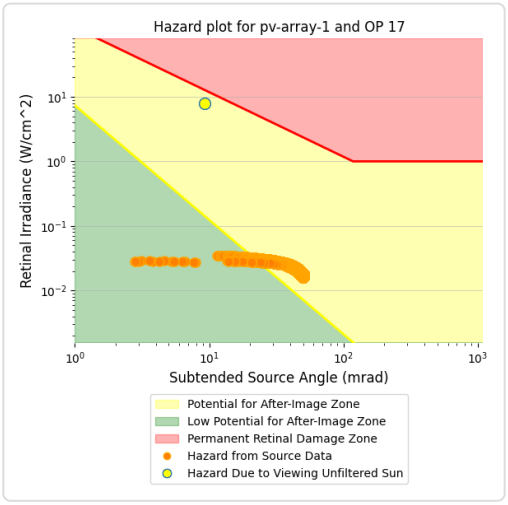
PV array 1 and OP 17

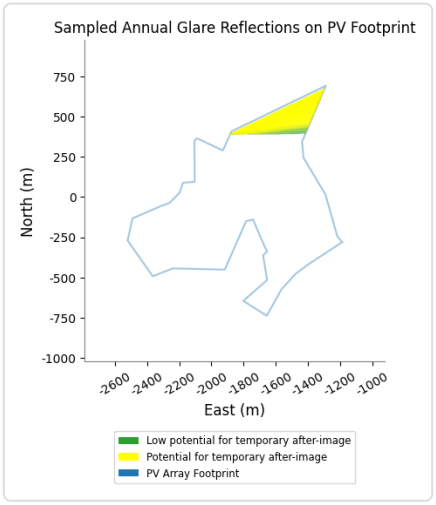
Yellow glare: 4,436 min.

Green glare: 481 min.





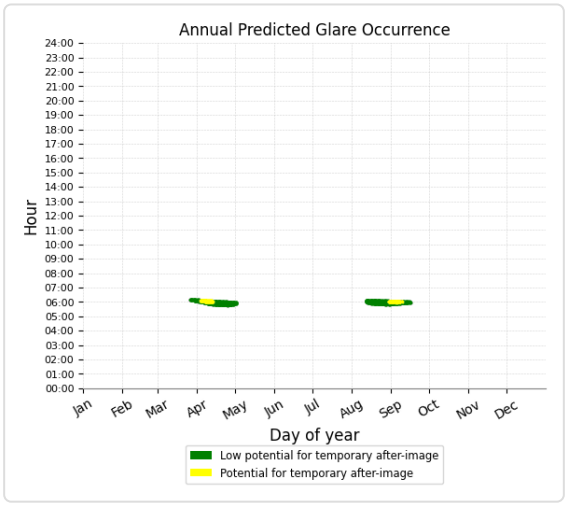


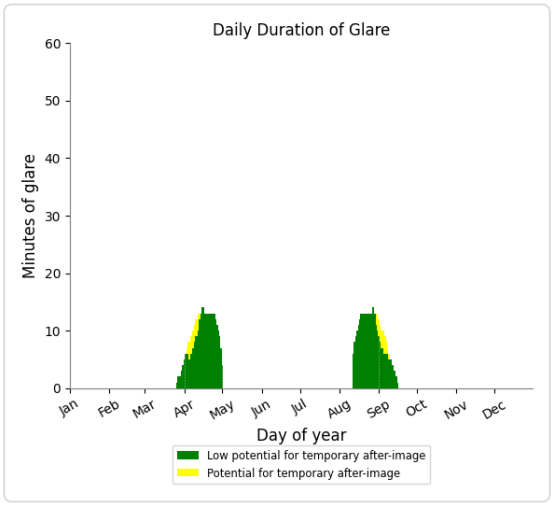


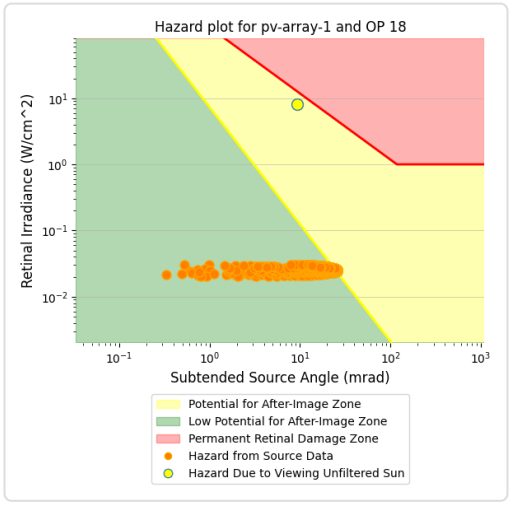
PV array 1 and OP 18

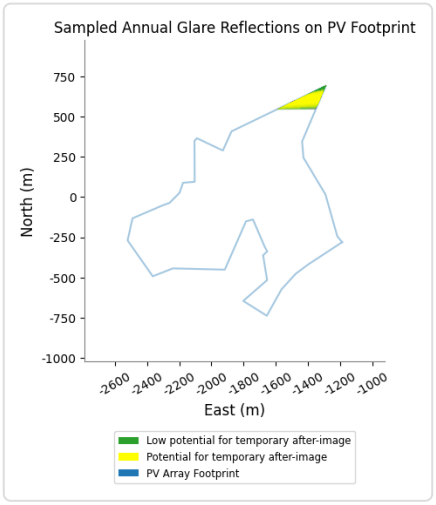
Yellow glare: 56 min.

Green glare: 638 min.





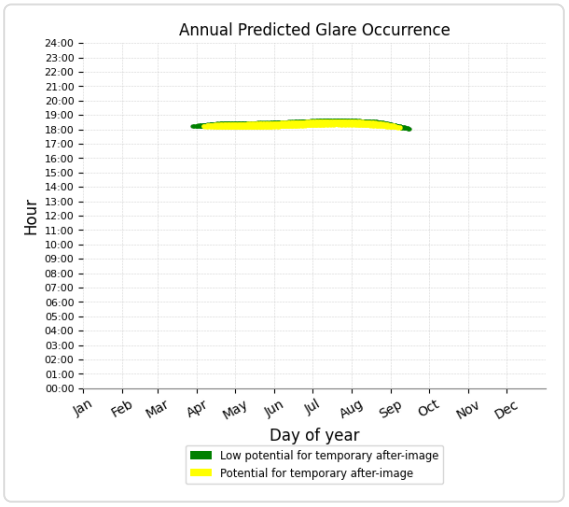


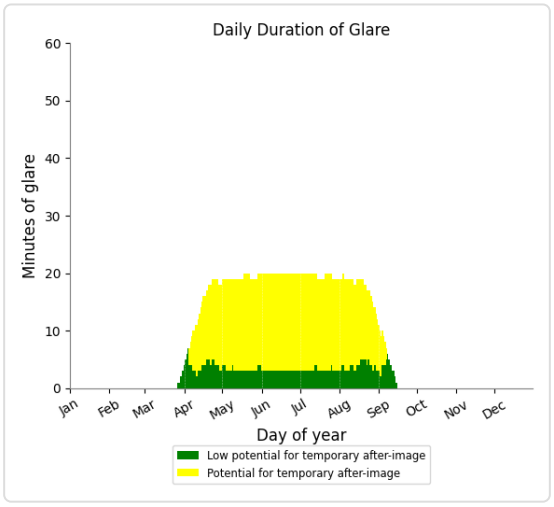


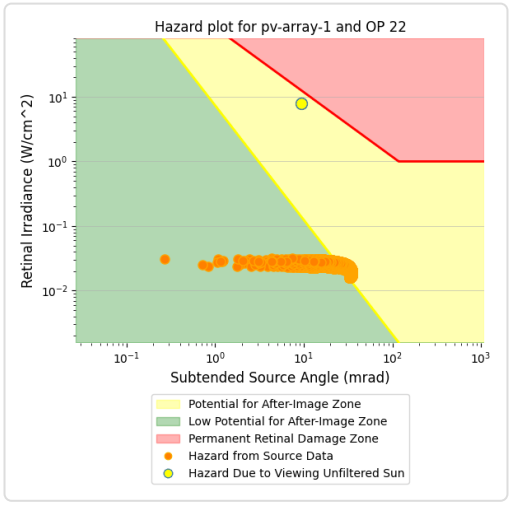
PV array 1 and OP 22

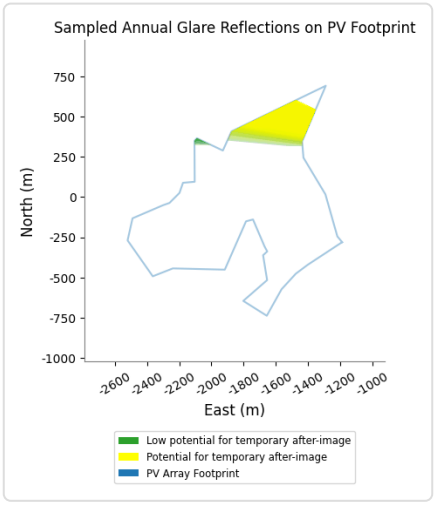
Yellow glare: 2,282 min.

Green glare: 585 min.





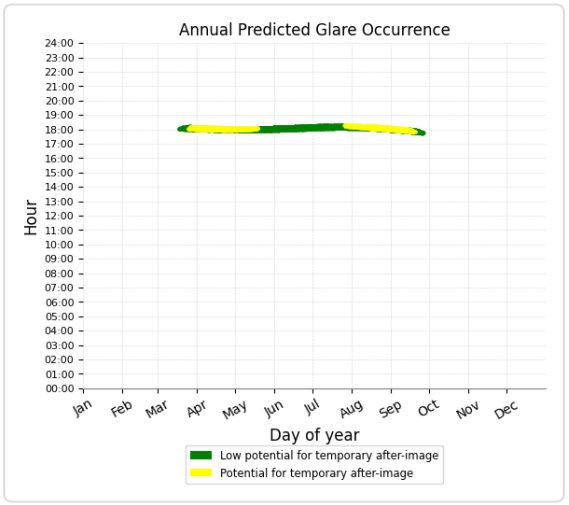


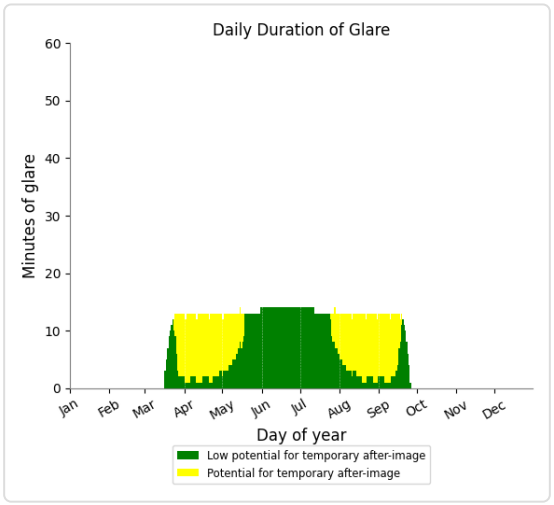


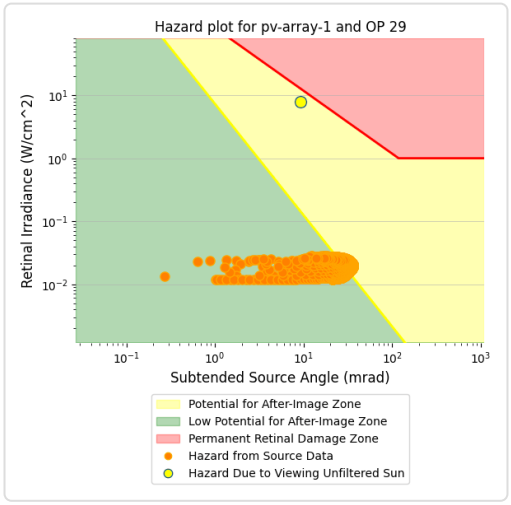
PV array 1 and OP 29

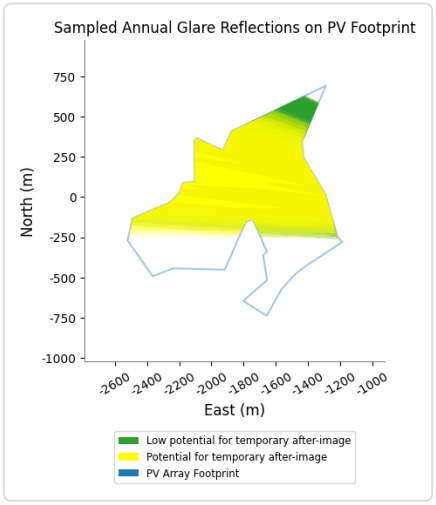
Yellow glare: 1,093 min.

Green glare: 1,391 min.





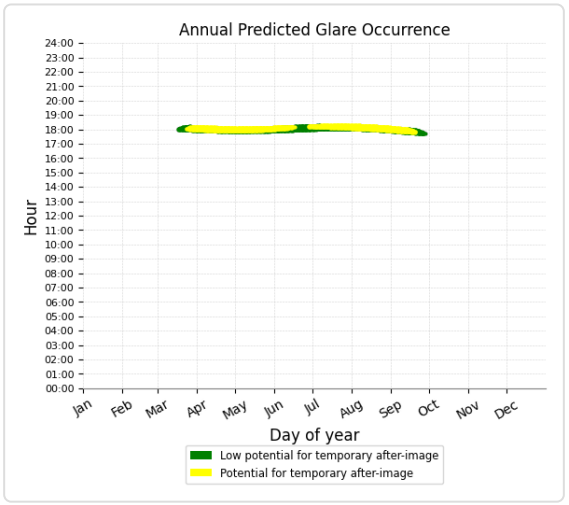


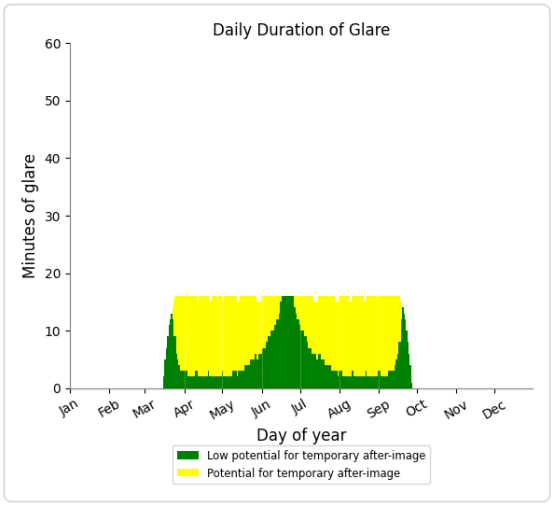


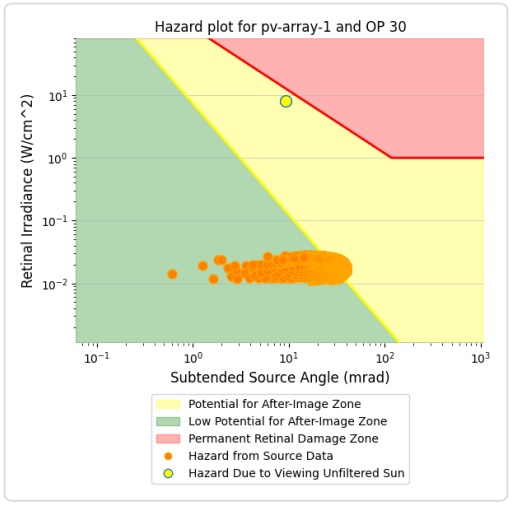
PV array 1 and OP 30

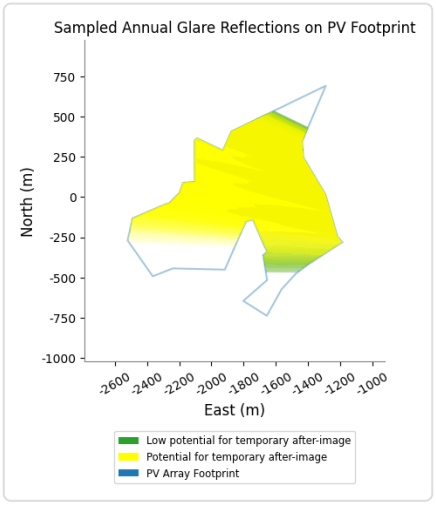
Yellow glare: 1,950 min.

Green glare: 1,049 min.





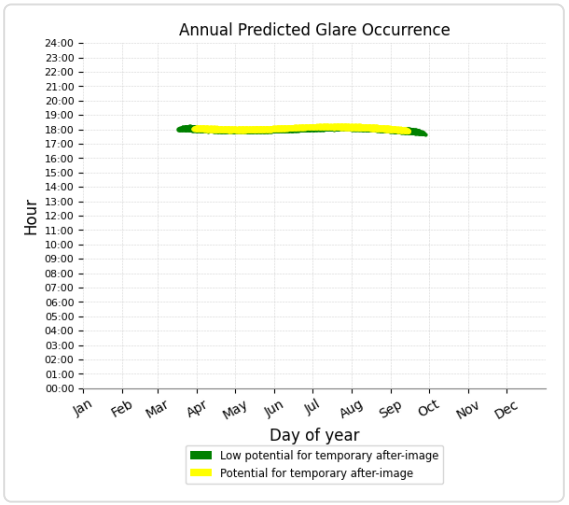


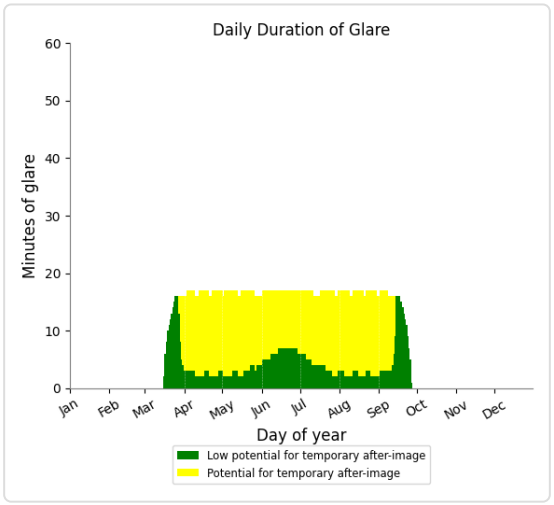


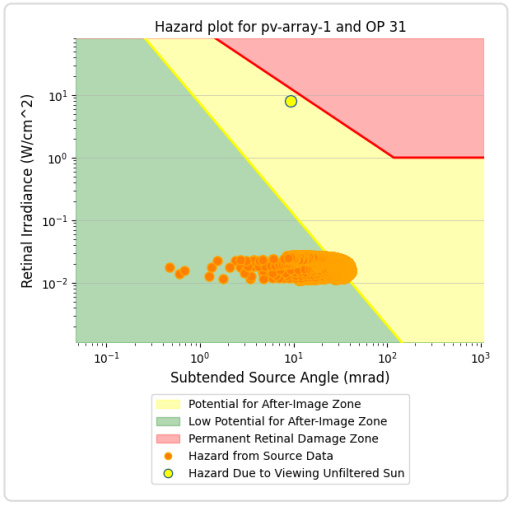
PV array 1 and OP 31

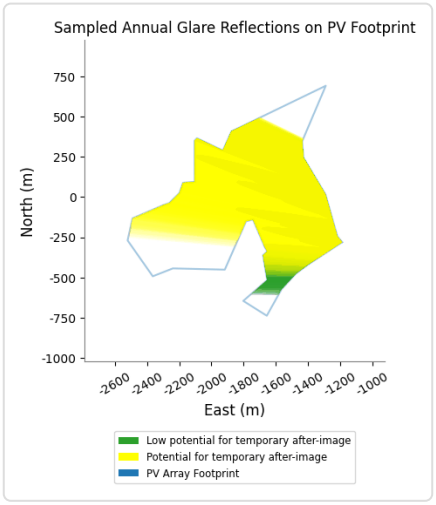
Yellow glare: 2,235 min.

Green glare: 923 min.





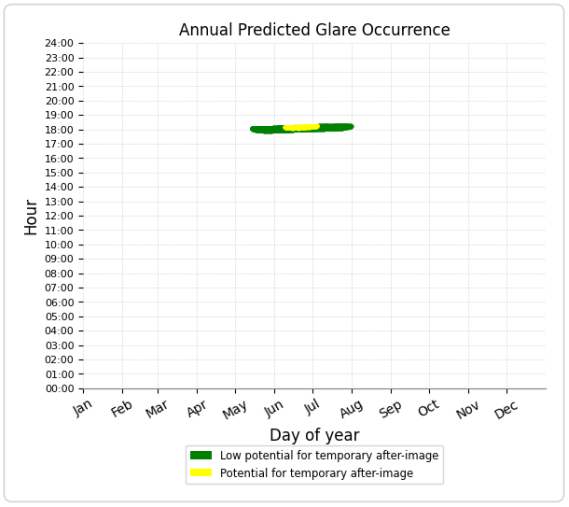


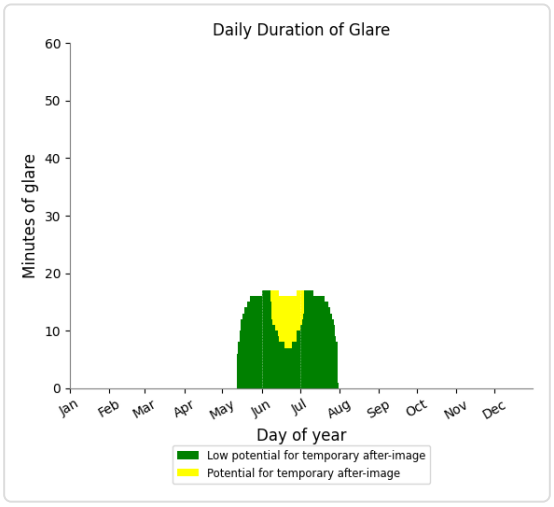


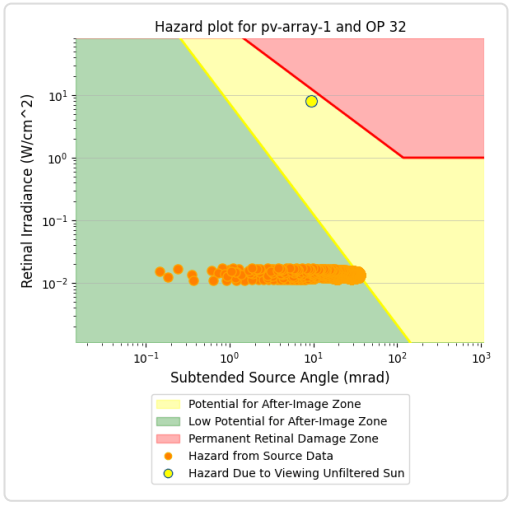
PV array 1 and OP 32

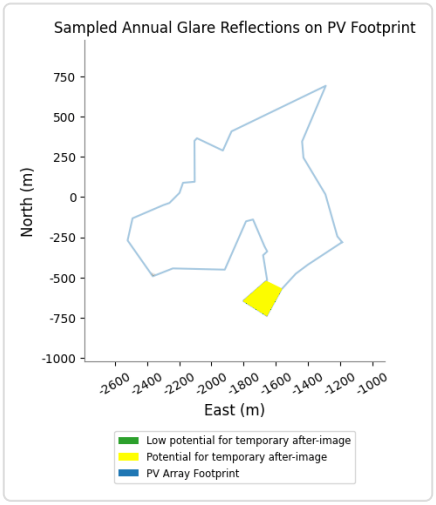
Yellow glare: 195 min.

Green glare: 1,021 min.





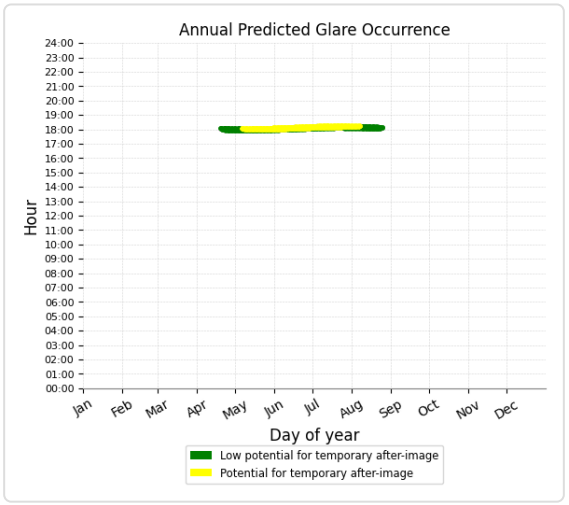


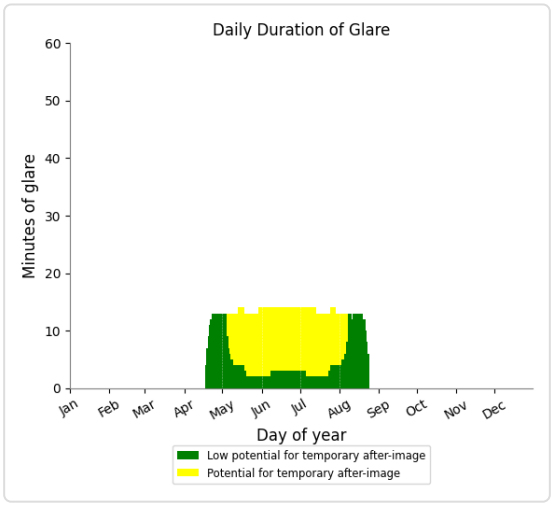


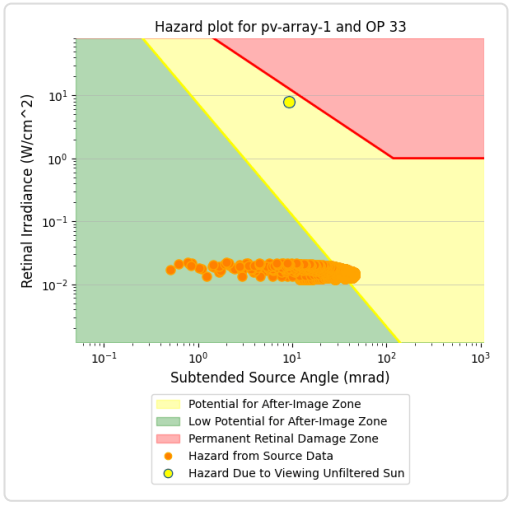
PV array 1 and OP 33

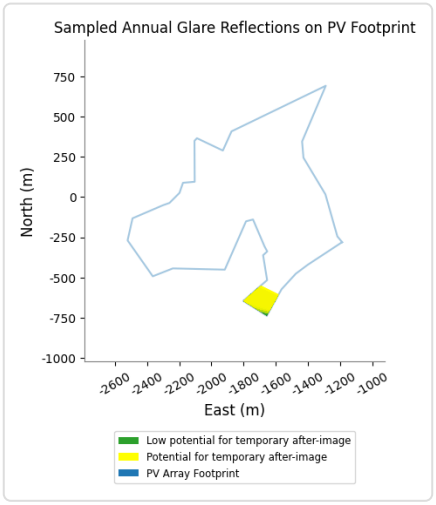
Yellow glare: 992 min.

Green glare: 700 min.





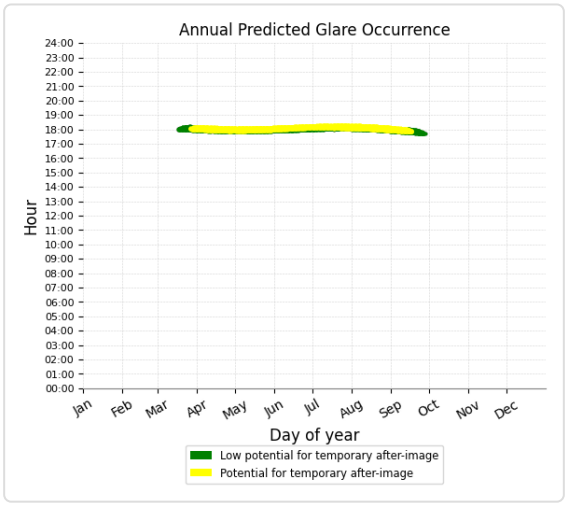


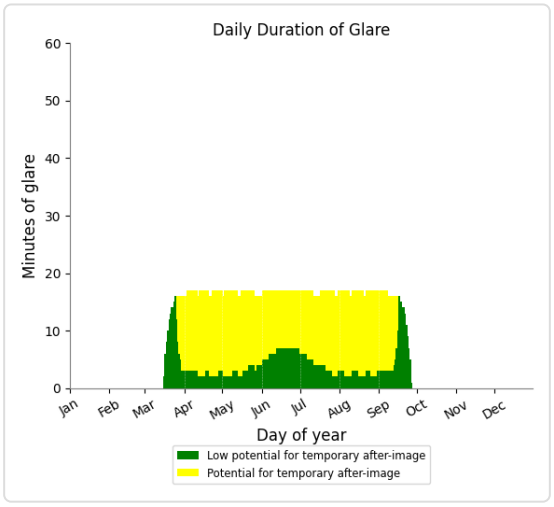


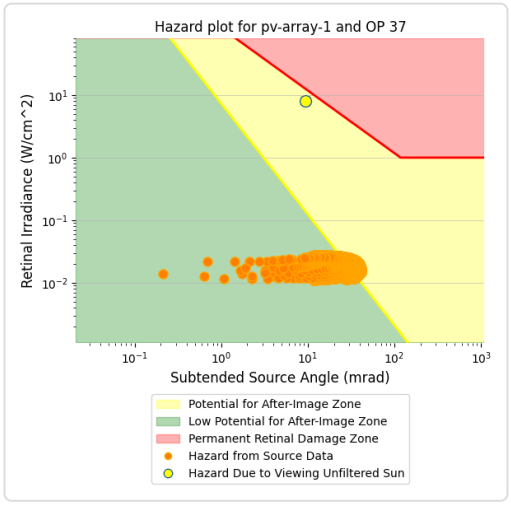
PV array 1 and OP 37

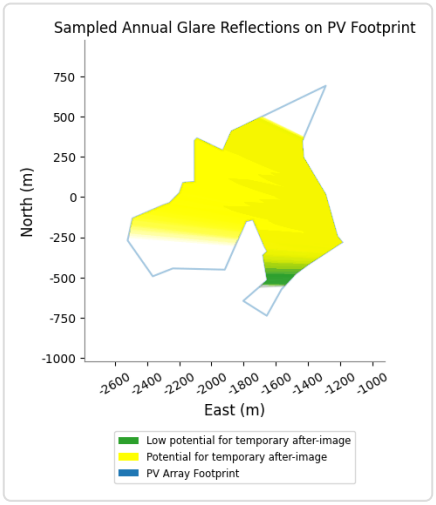
Yellow glare: 2,276 min.

Green glare: 892 min.





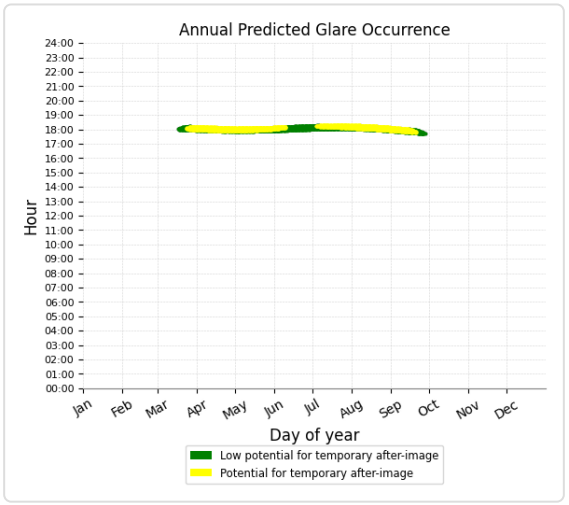


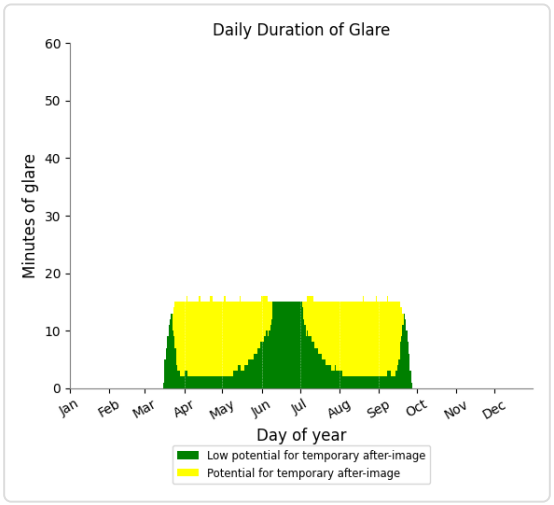


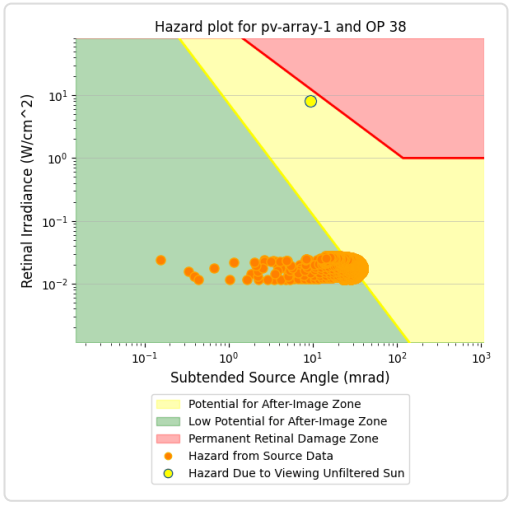
PV array 1 and OP 38

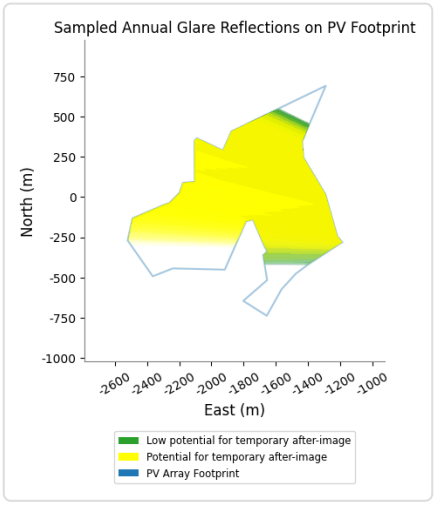
Yellow glare: 1,764 min.

Green glare: 1,089 min.





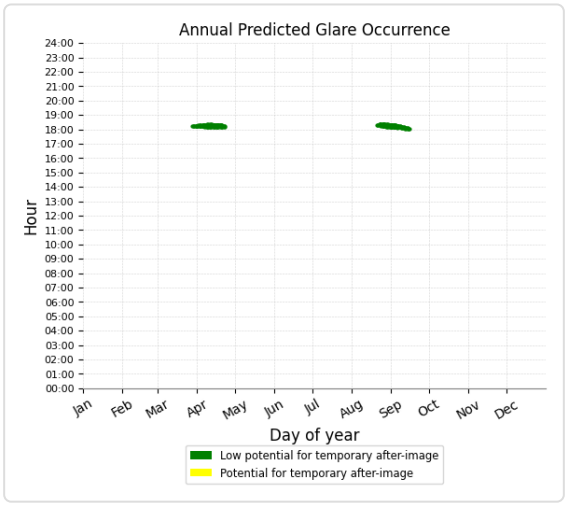


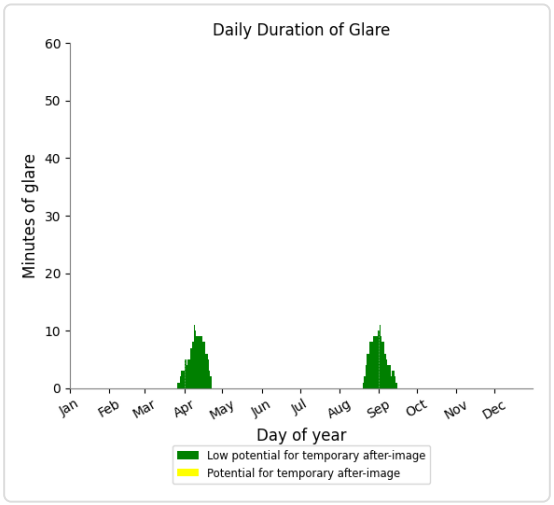


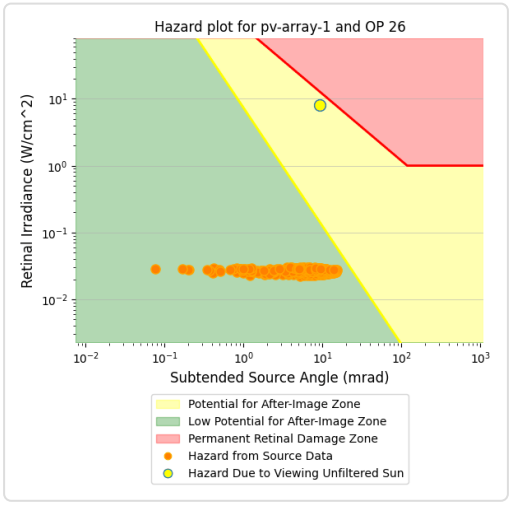
PV array 1 and OP 26

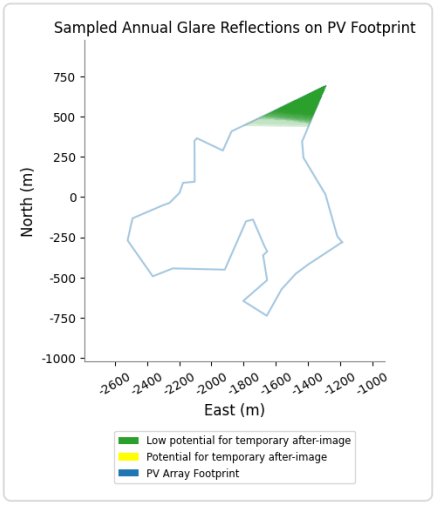
Yellow glare: none

Green glare: 317 min.





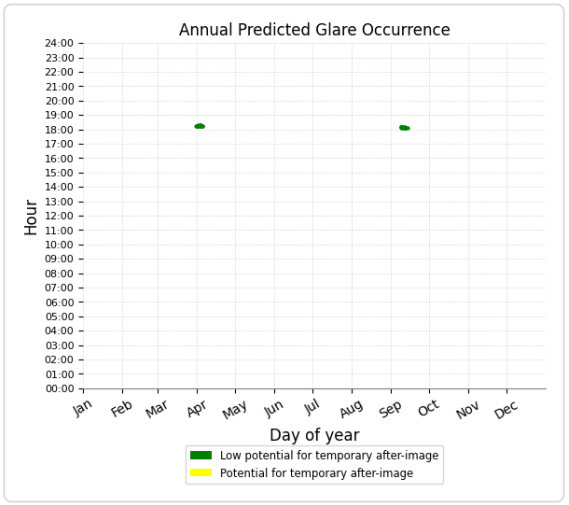


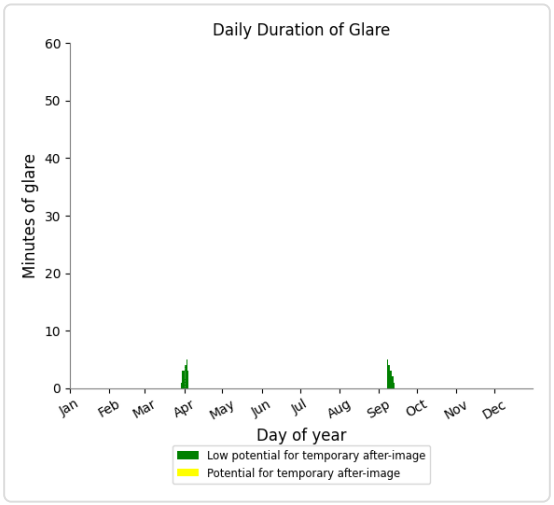


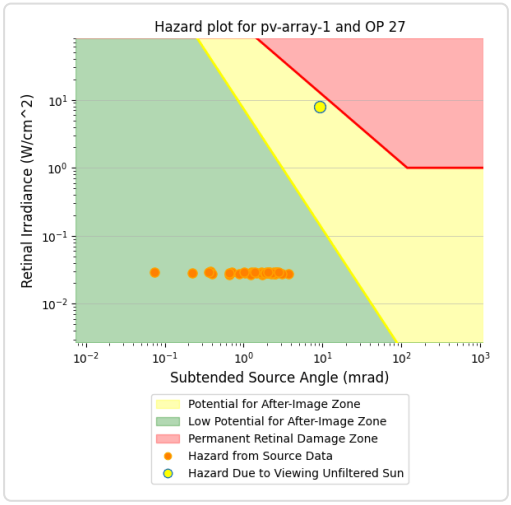
PV array 1 and OP 27

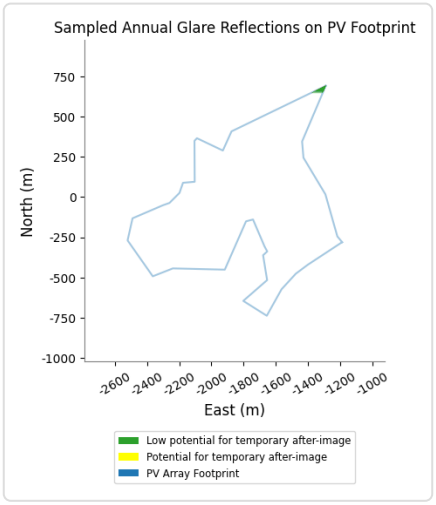
Yellow glare: none

Green glare: 37 min.





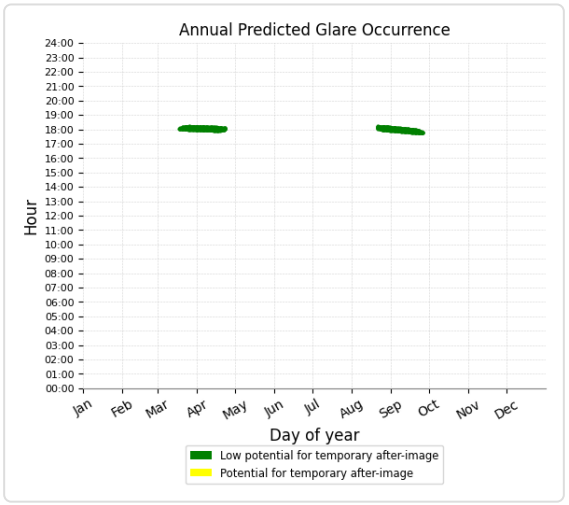


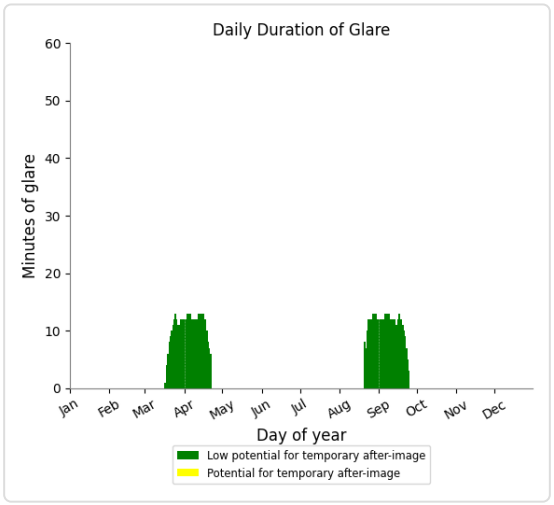


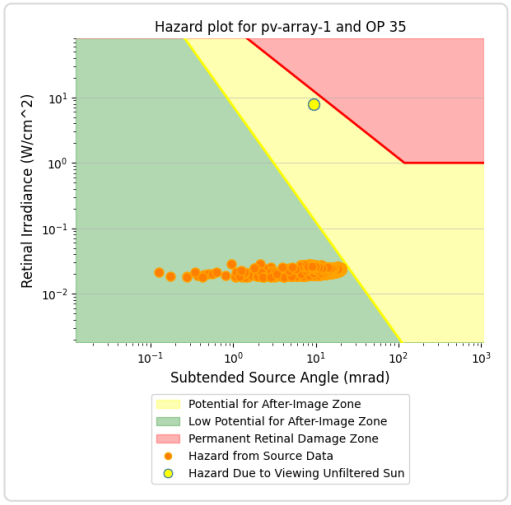
PV array 1 and OP 35

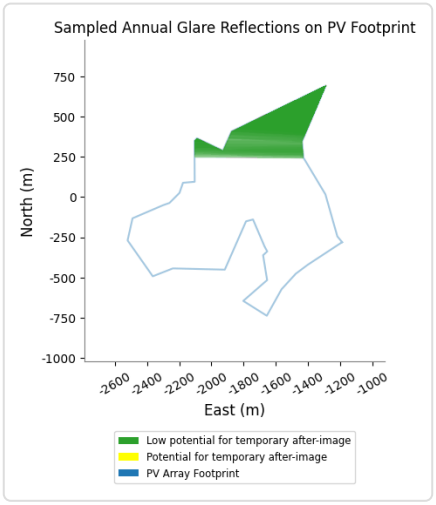
Yellow glare: none

Green glare: 802 min.









PV array 1 and OP 1

No glare found

PV array 1 and OP 2

No glare found

PV array 1 and OP 3

No glare found

PV array 1 and OP 4

No glare found

PV array 1 and OP 5

No glare found

PV array 1 and OP 6

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV array 1 and OP 28

No glare found

PV array 1 and OP 34

No glare found

PV array 1 and OP 36

No glare found

PV: PV array 2 potential temporary after-image

Receptor results ordered by category of glare

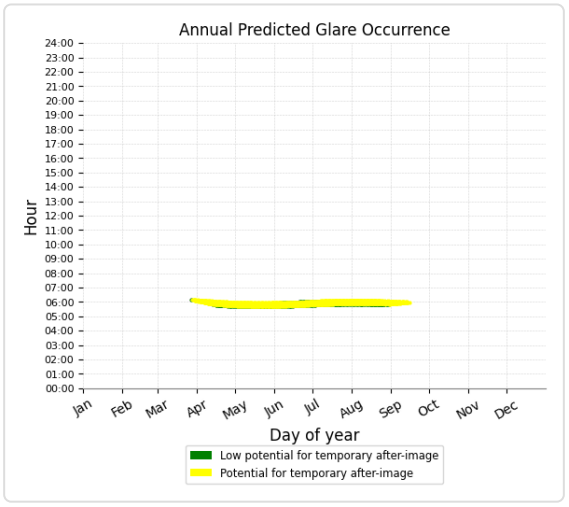
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arbour lane	269	4.5	2,264	37.7
B6094 and Ruddle Lane	2,290	38.2	1,728	28.8
M18	1,047	17.4	2,835	47.2
B6093	0	0.0	0	0.0
OP 1	1,102	18.4	527	8.8
OP 2	886	14.8	1,455	24.2
OP 3	884	14.7	1,792	29.9
OP 6	507	8.4	1,466	24.4
OP 7	316	5.3	2,058	34.3
OP 8	298	5.0	1,561	26.0
OP 9	274	4.6	1,627	27.1
OP 10	921	15.3	1,263	21.1
OP 22	1,064	17.7	243	4.0
OP 29	789	13.2	3,308	55.1
OP 30	1,464	24.4	3,842	64.0
OP 31	1,256	20.9	4,185	69.8
OP 32	806	13.4	2,668	44.5
OP 33	211,069	3,517.8	20,596	343.3
OP 36	815	13.6	1,768	29.5
OP 37	1,405	23.4	4,373	72.9
OP 38	1,328	22.1	3,713	61.9
OP 4	302	5.0	0	0.0
OP 11	648	10.8	0	0.0
OP 12	644	10.7	0	0.0
OP 13	156	2.6	0	0.0
OP 14	68	1.1	0	0.0
OP 15	22	0.4	0	0.0
OP 17	19	0.3	0	0.0
OP 35	497	8.3	0	0.0
OP 5	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0

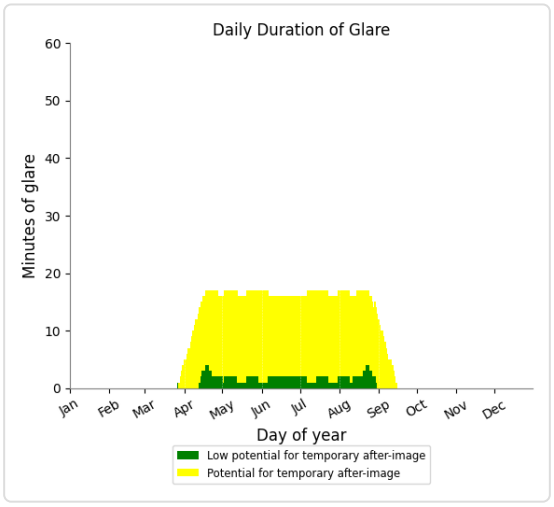
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 34	0	0.0	0	0.0

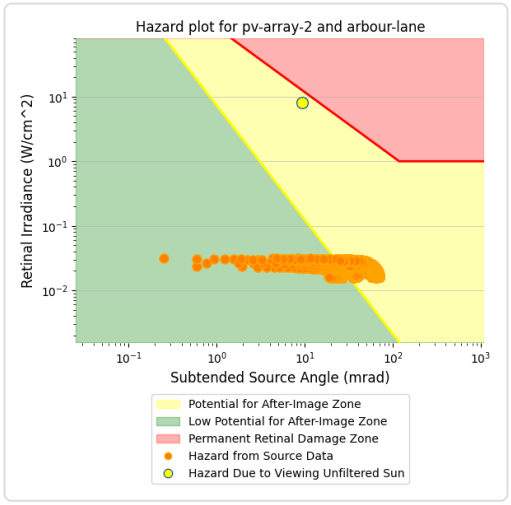
PV array 2 and Route: Arbour lane

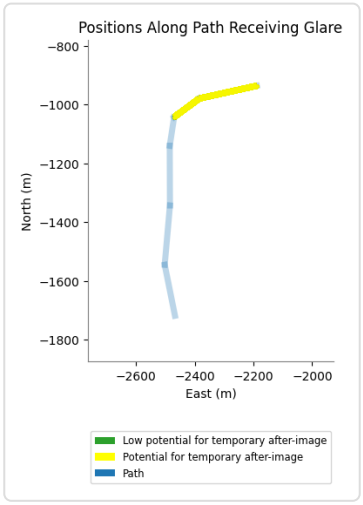
Yellow glare: 2,264 min.

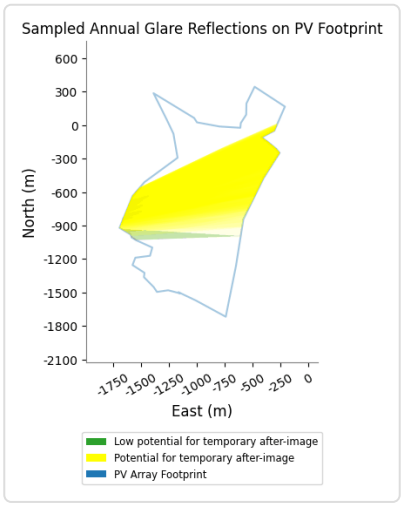
Green glare: 269 min.







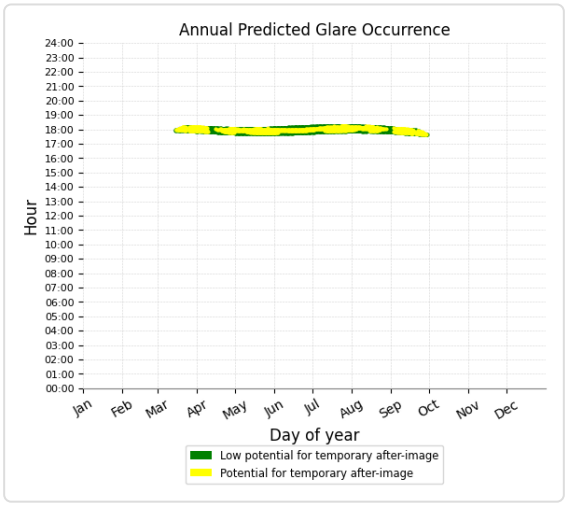


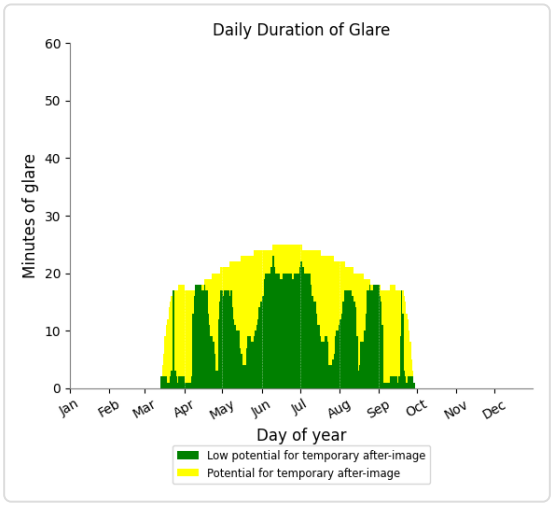


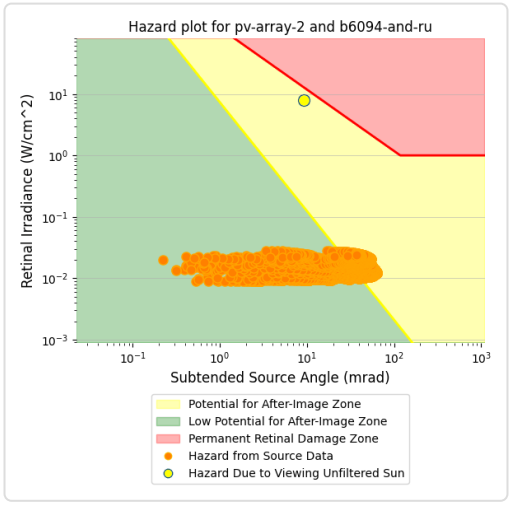
PV array 2 and Route: B6094 and Ruddle Lane

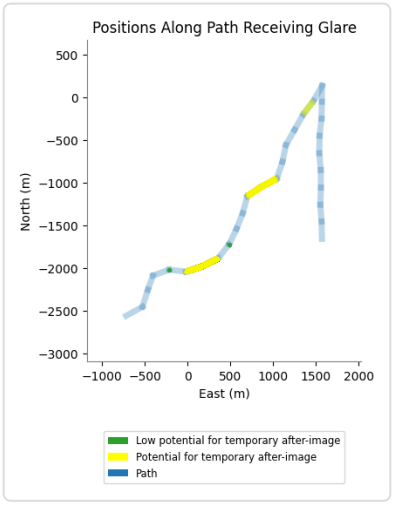
Yellow glare: 1,728 min.

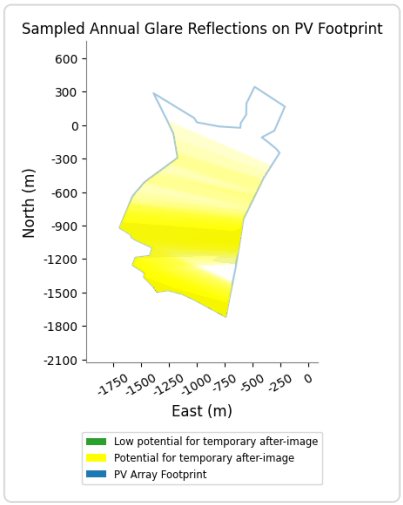
Green glare: 2,290 min.







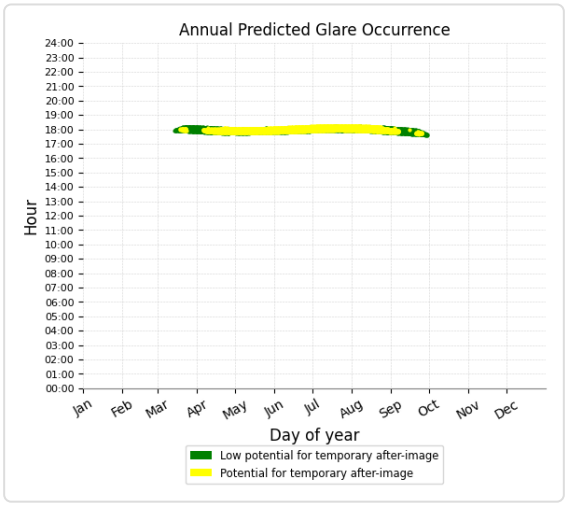


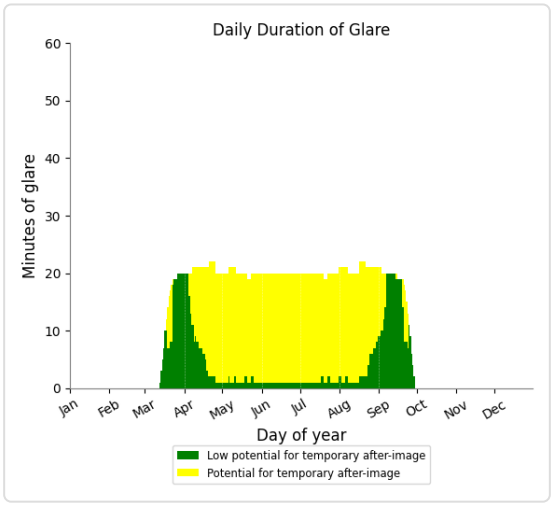


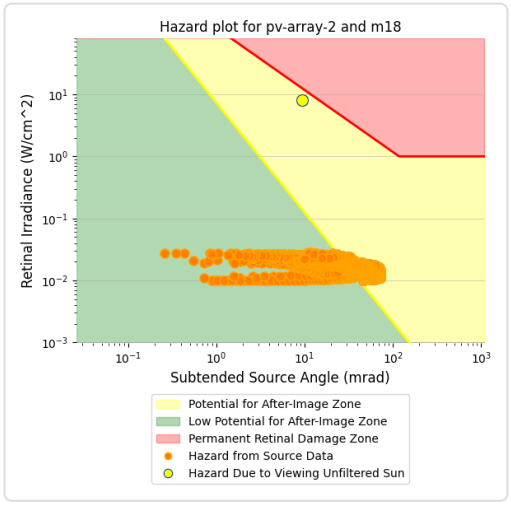
PV array 2 and Route: M18

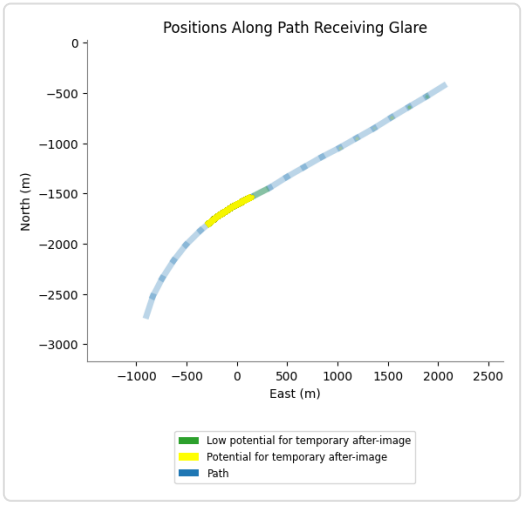
Yellow glare: 2,835 min.

Green glare: 1,047 min.











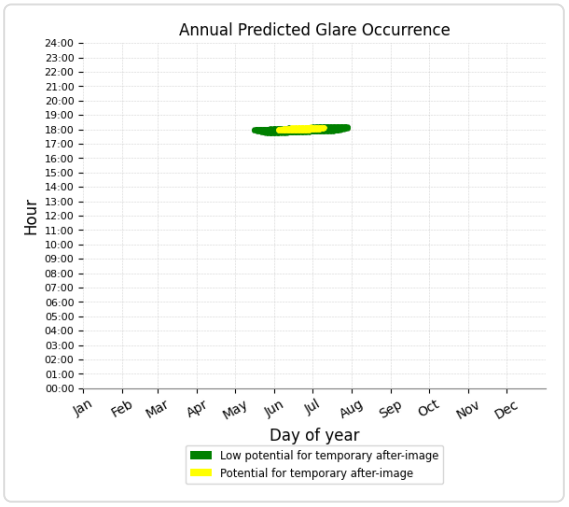
PV array 2 and Route: B6093

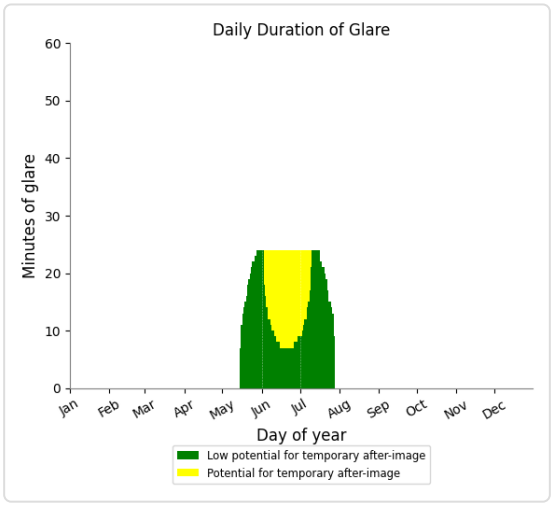
No glare found

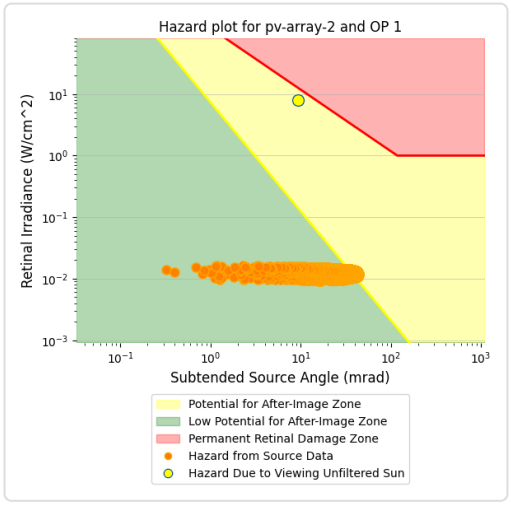
PV array 2 and OP 1

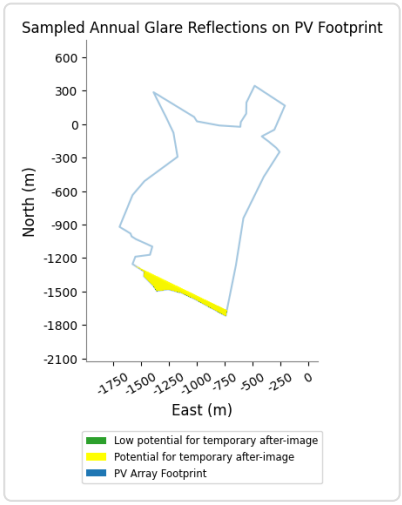
Yellow glare: 527 min.

Green glare: 1,102 min.





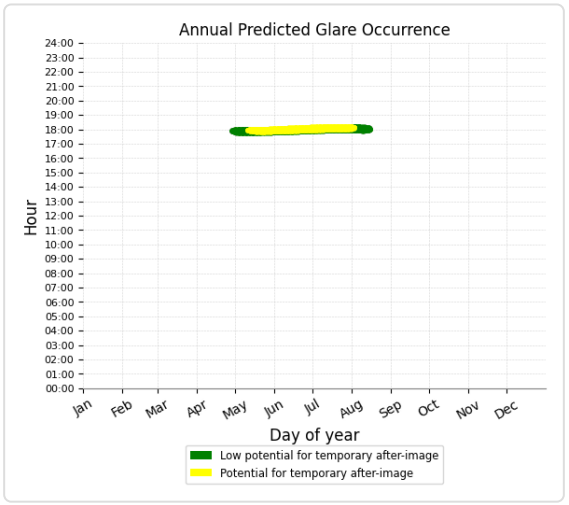


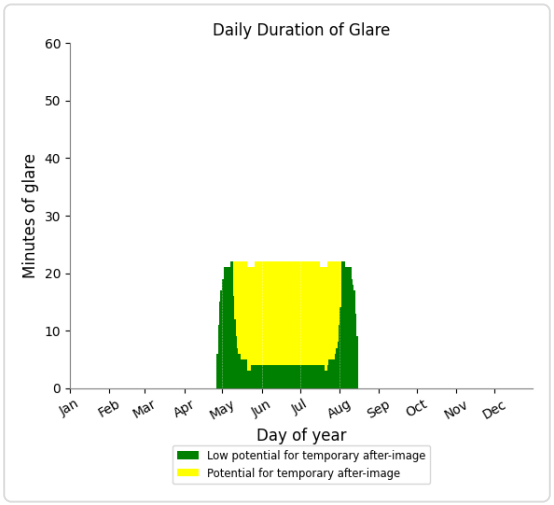


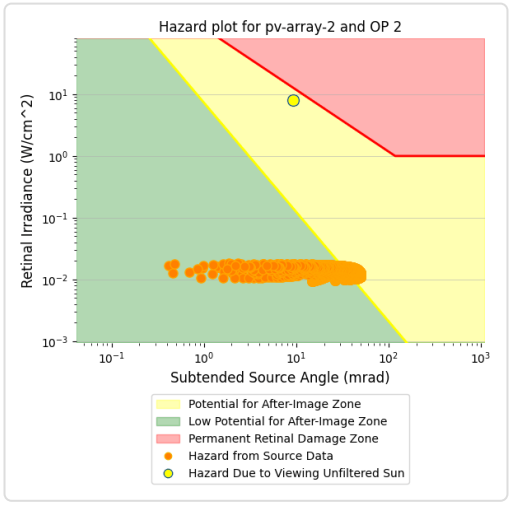
PV array 2 and OP 2

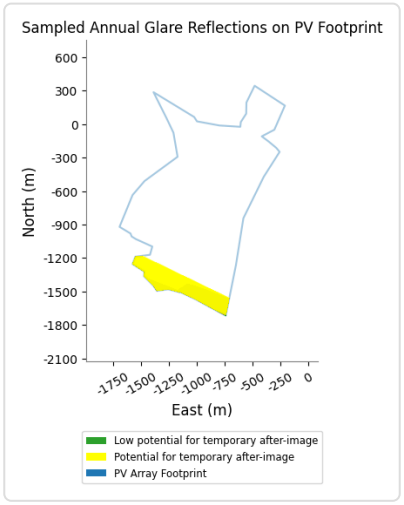
Yellow glare: 1,455 min.

Green glare: 886 min.





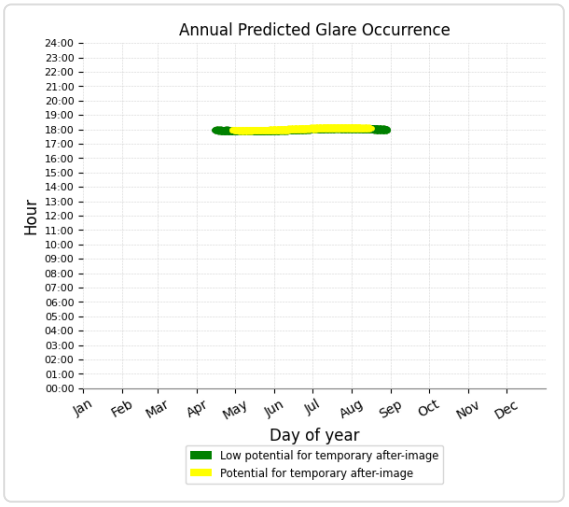


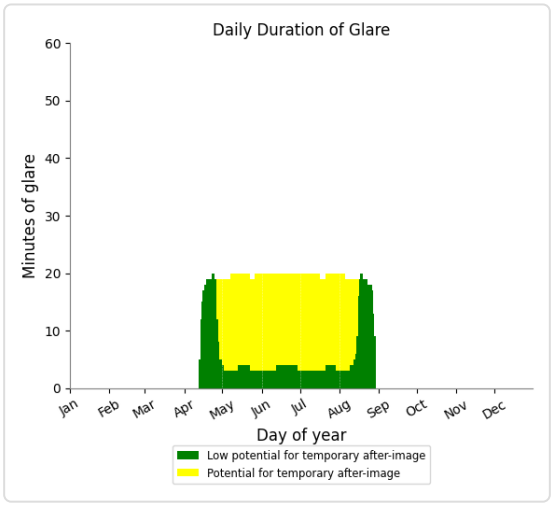


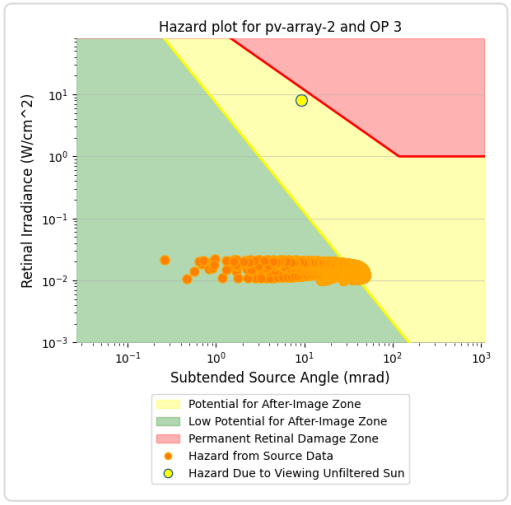
PV array 2 and OP 3

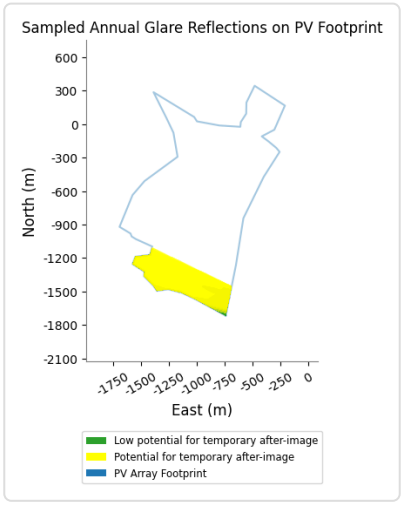
Yellow glare: 1,792 min.

Green glare: 884 min.





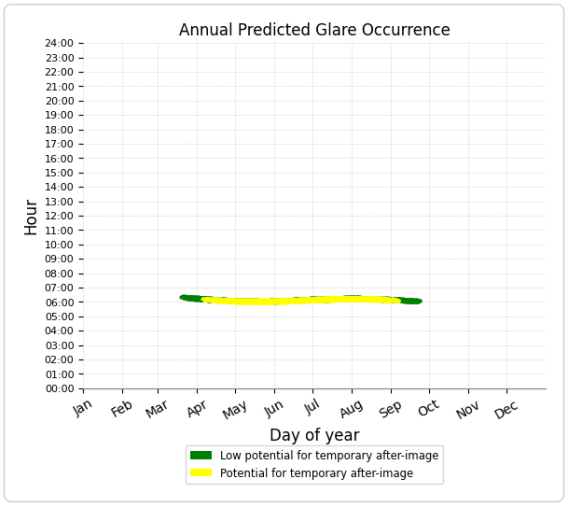


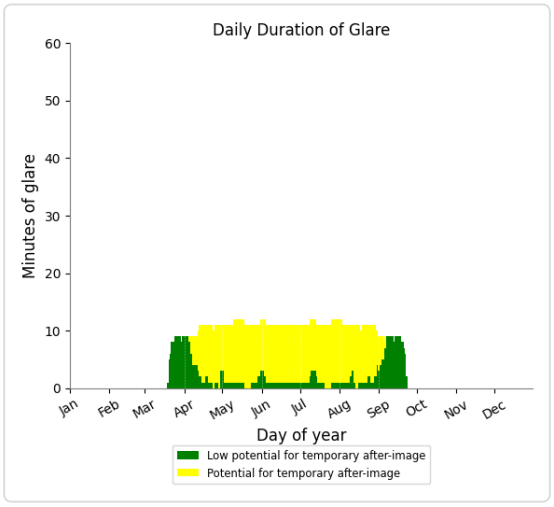


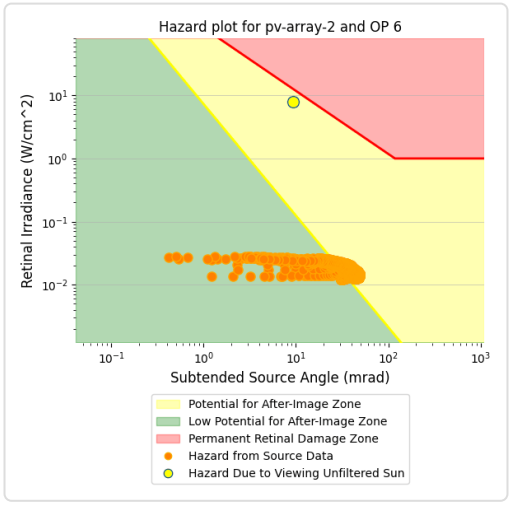
PV array 2 and OP 6

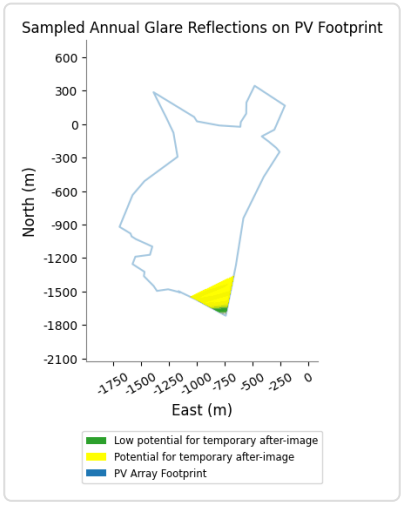
Yellow glare: 1,466 min.

Green glare: 507 min.





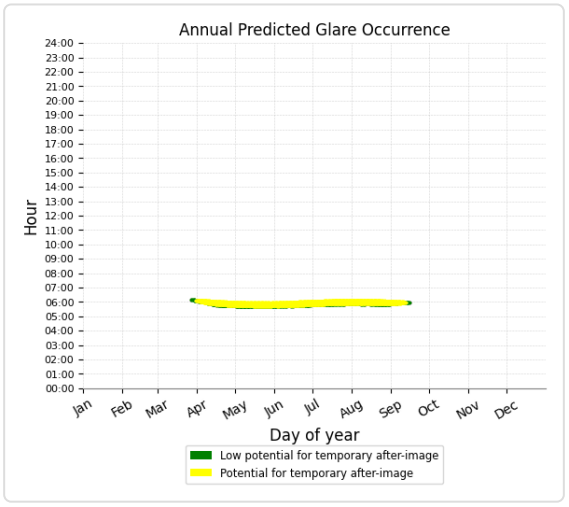


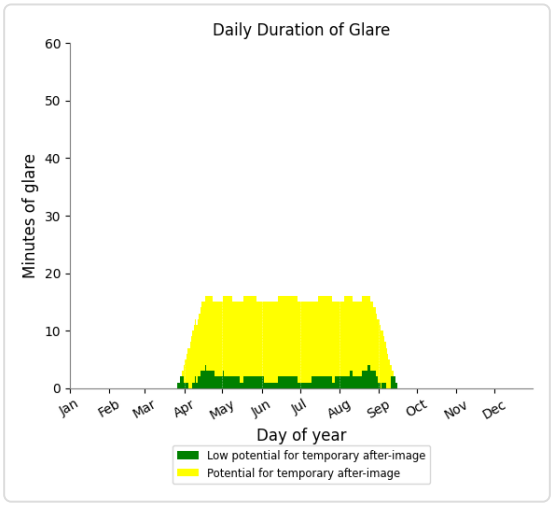


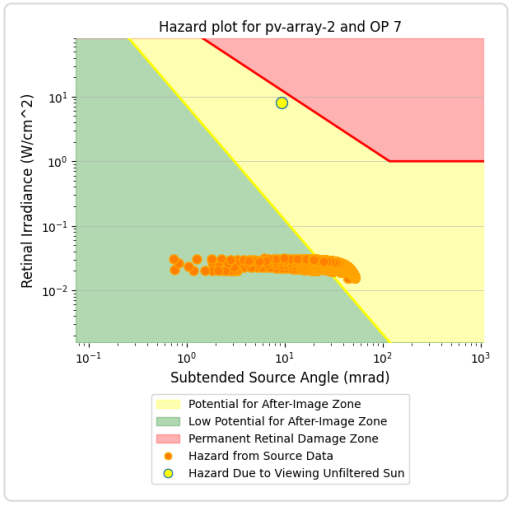
PV array 2 and OP 7

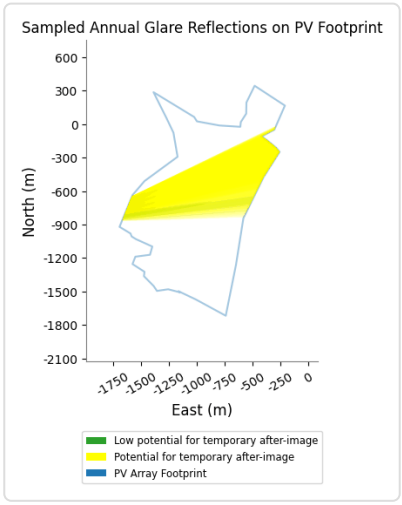
Yellow glare: 2,058 min.

Green glare: 316 min.





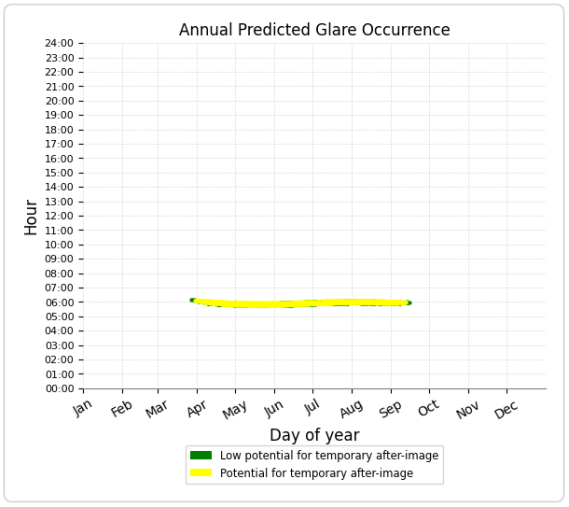


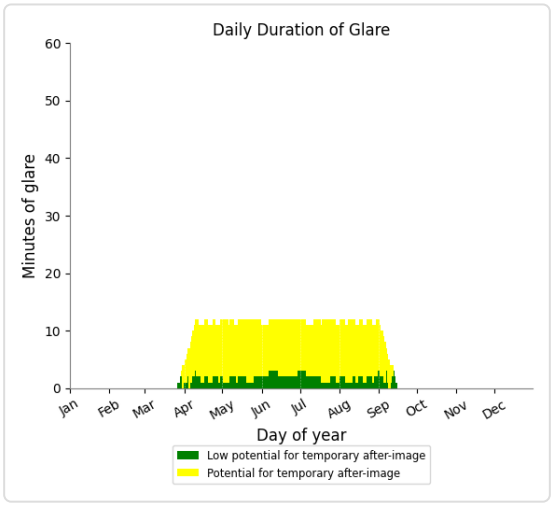


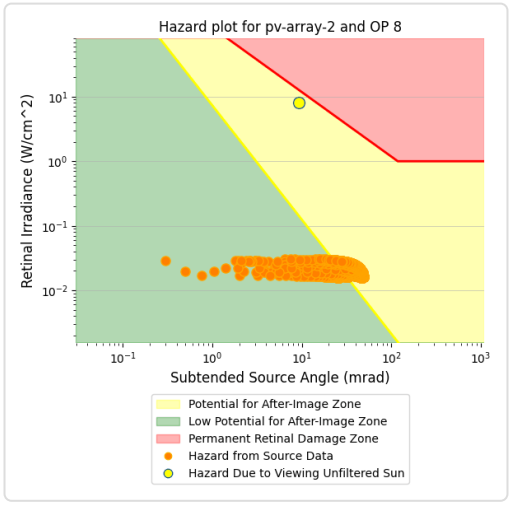
PV array 2 and OP 8

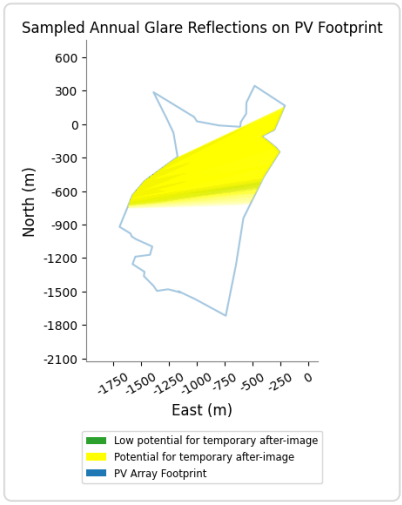
Yellow glare: 1,561 min.

Green glare: 298 min.





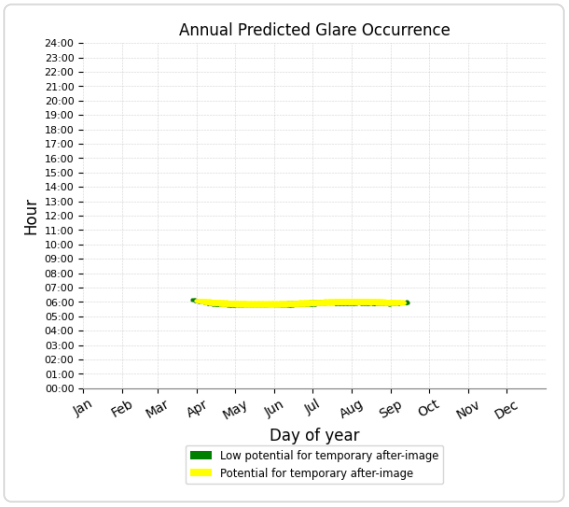


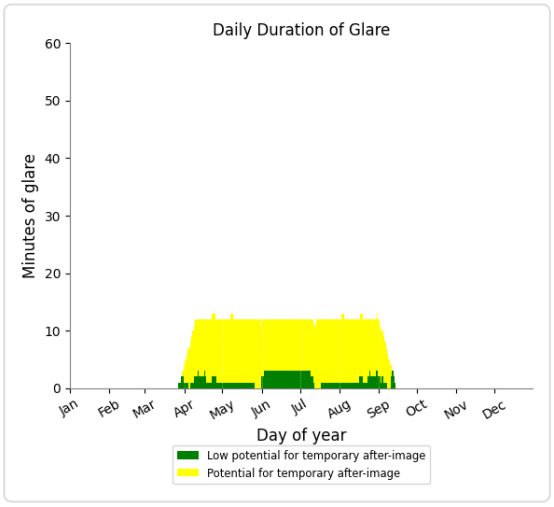


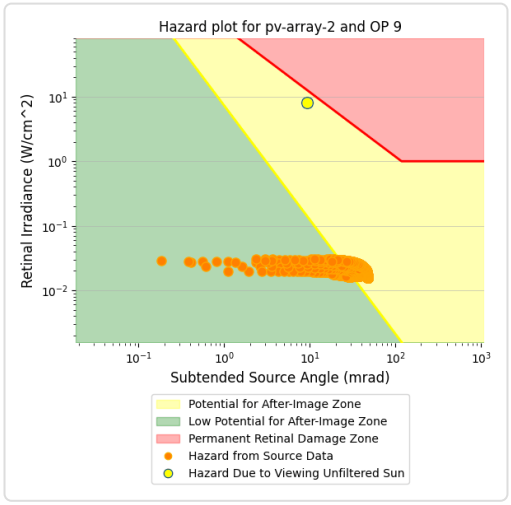
PV array 2 and OP 9

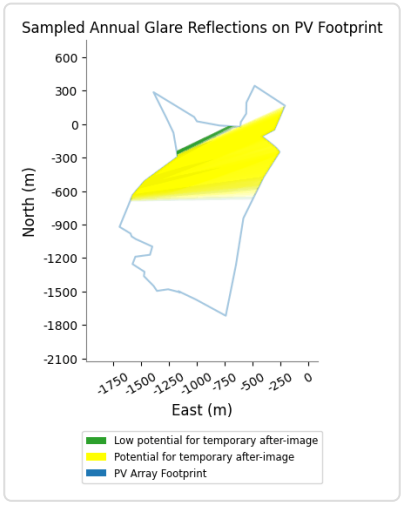
Yellow glare: 1,627 min.

Green glare: 274 min.





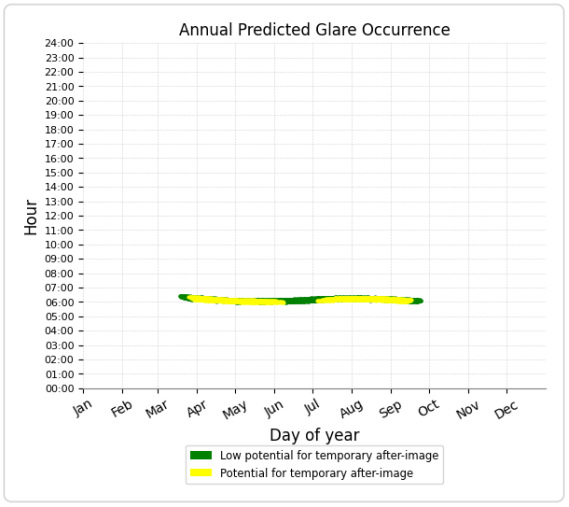


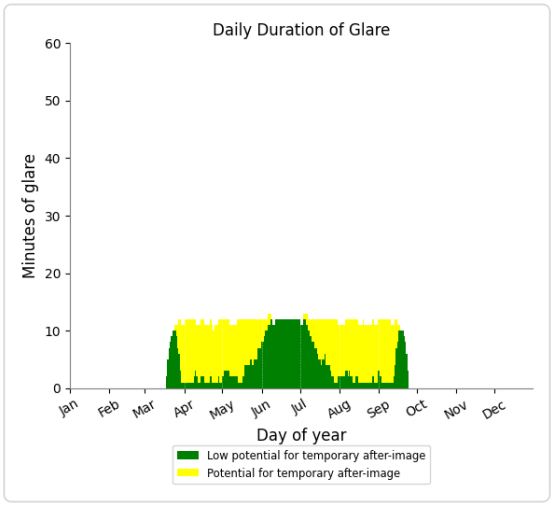


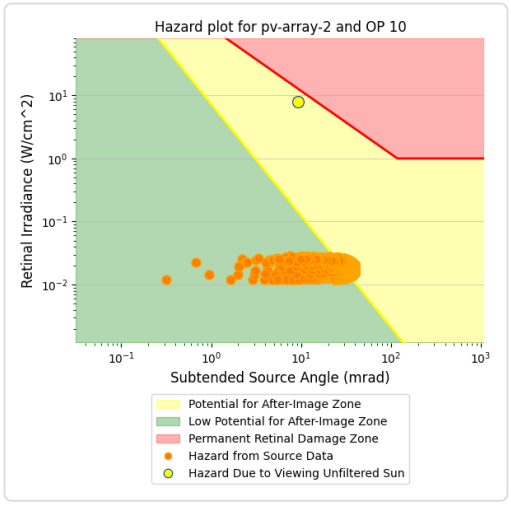
PV array 2 and OP 10

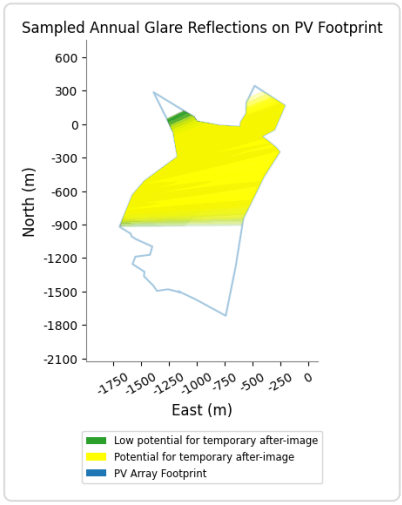
Yellow glare: 1,263 min.

Green glare: 921 min.





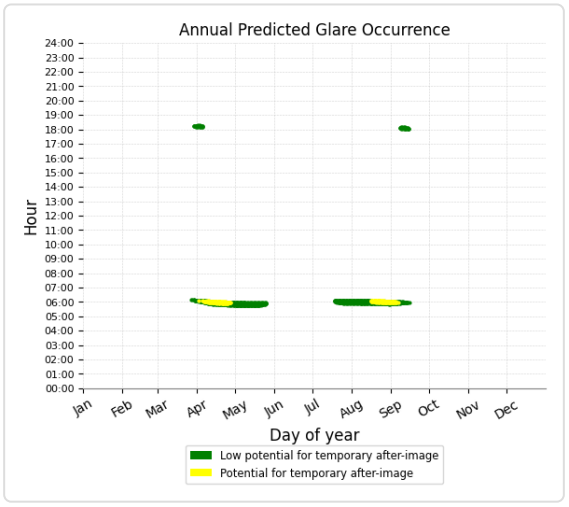


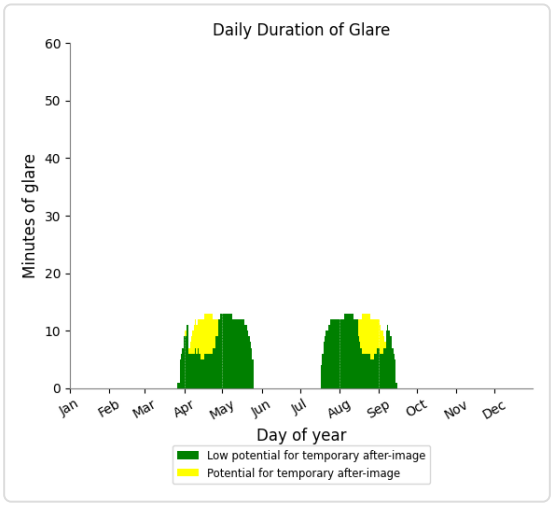


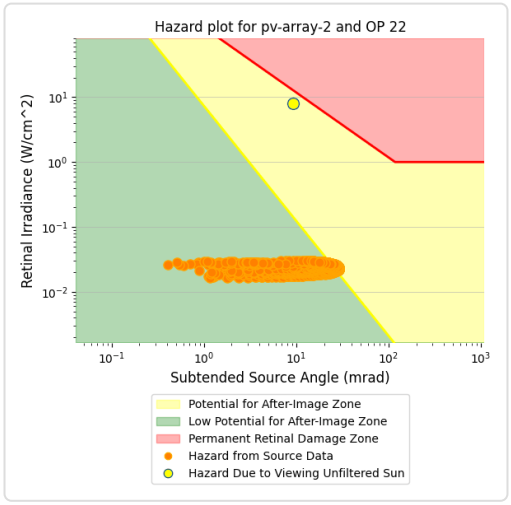
PV array 2 and OP 22

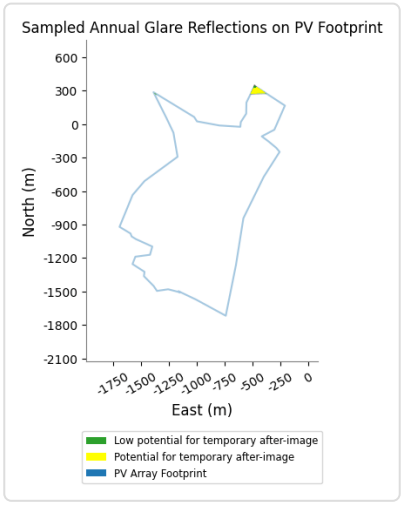
Yellow glare: 243 min.

Green glare: 1,064 min.





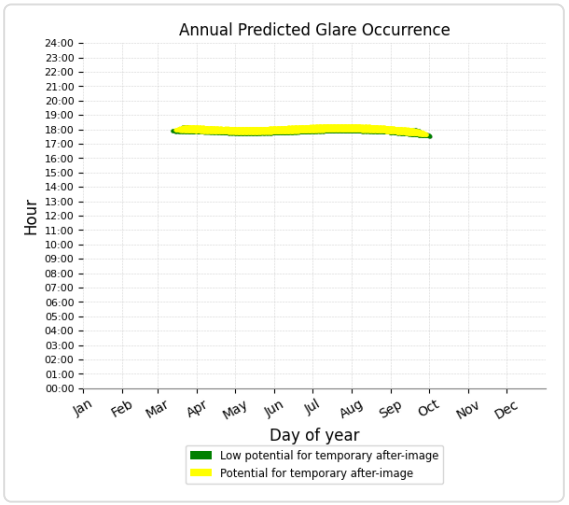


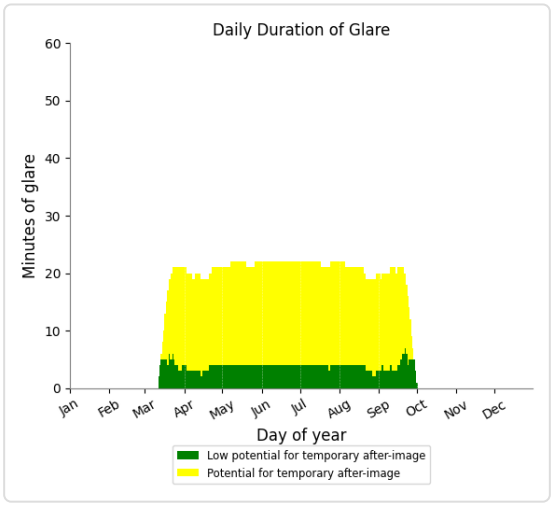


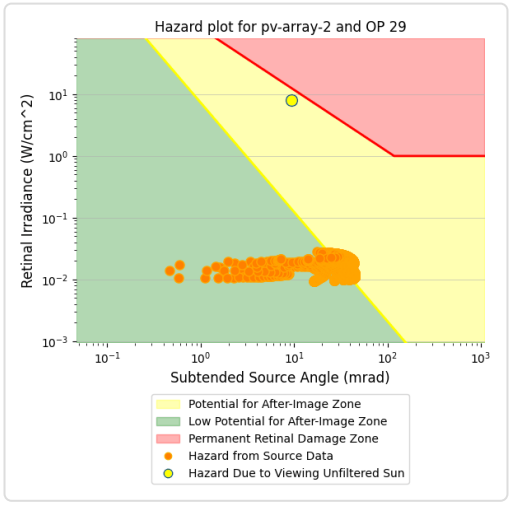
PV array 2 and OP 29

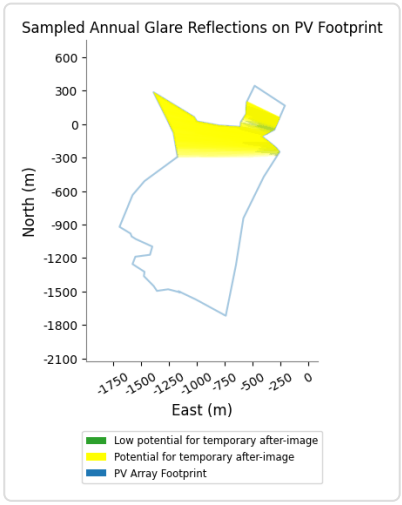
Yellow glare: 3,308 min.

Green glare: 789 min.





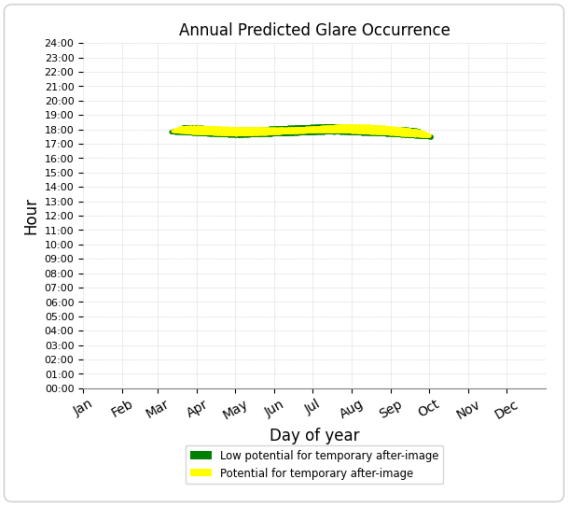


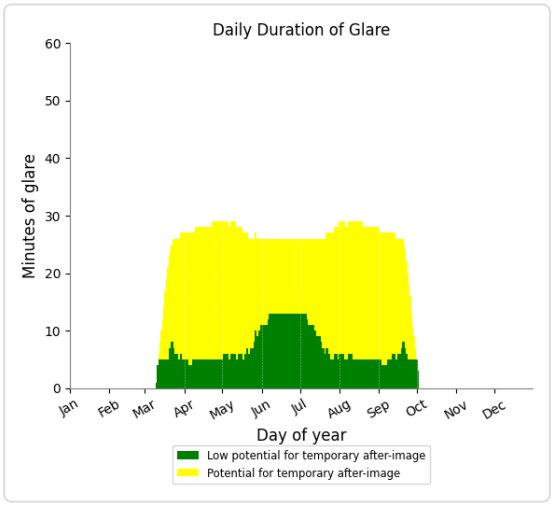


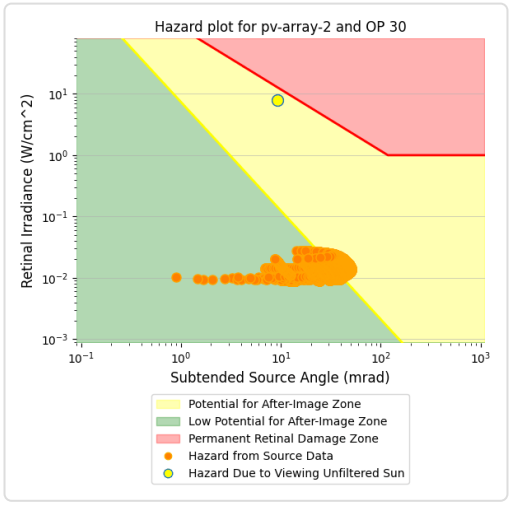
PV array 2 and OP 30

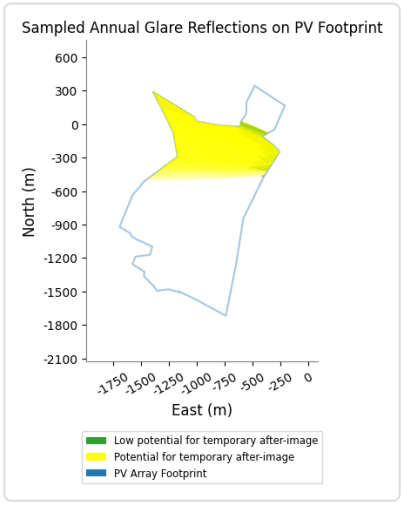
Yellow glare: 3,842 min.

Green glare: 1,464 min.





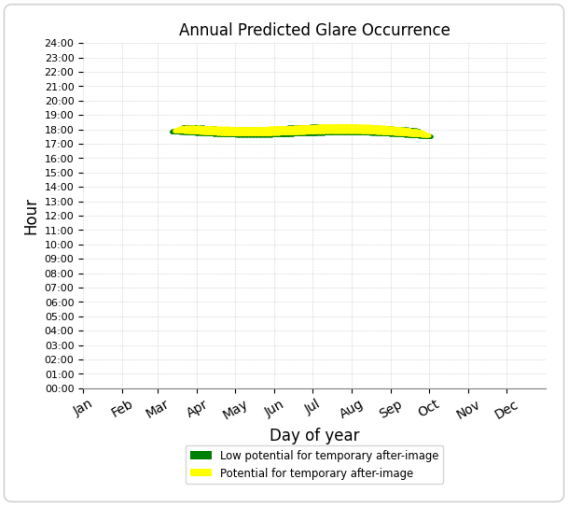


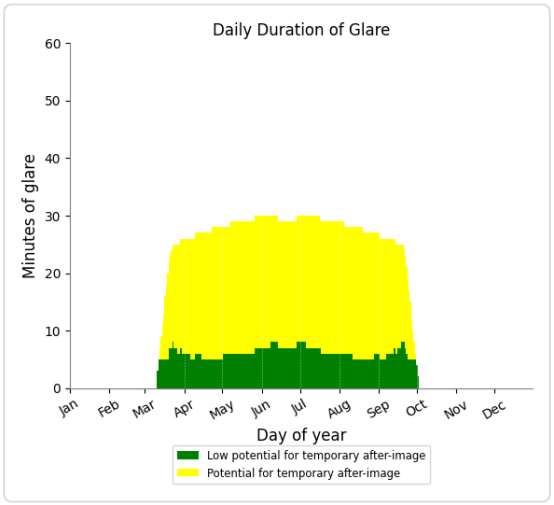


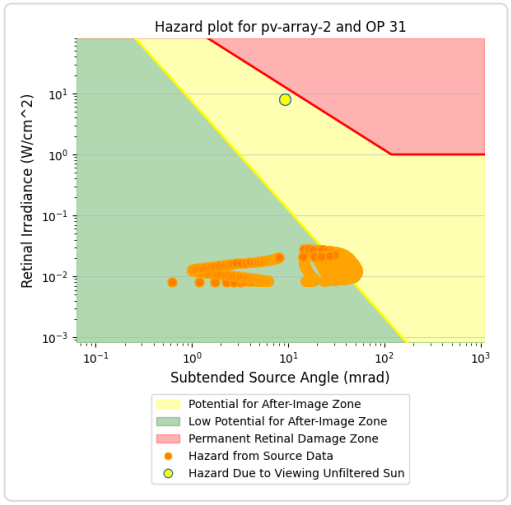
PV array 2 and OP 31

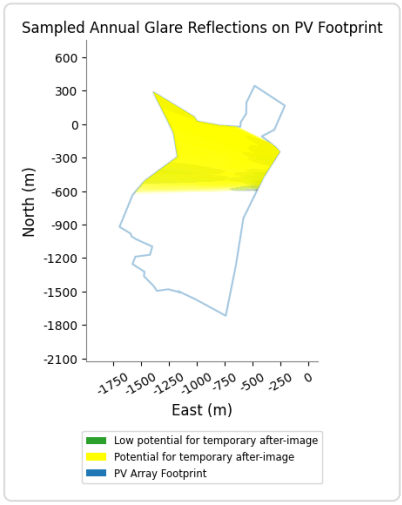
Yellow glare: 4,185 min.

Green glare: 1,256 min.





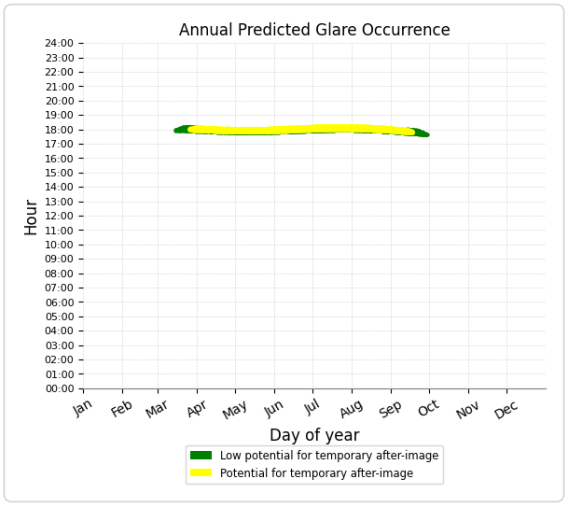


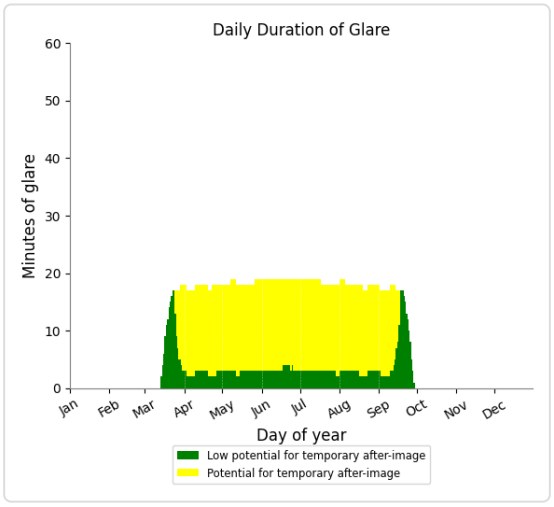


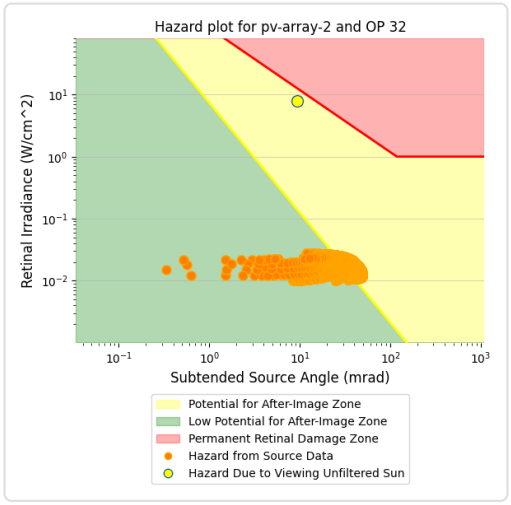
PV array 2 and OP 32

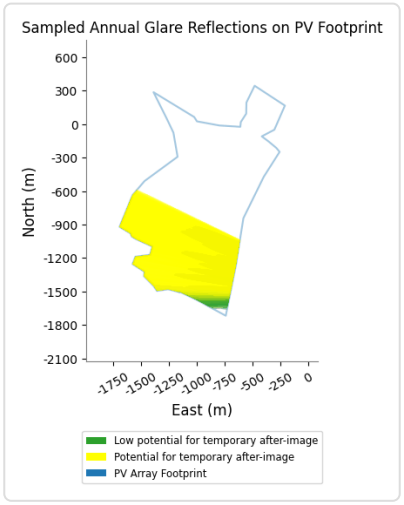
Yellow glare: 2,668 min.

Green glare: 806 min.





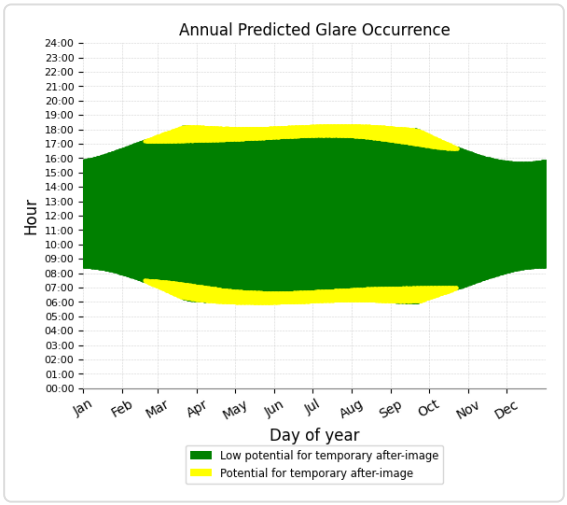


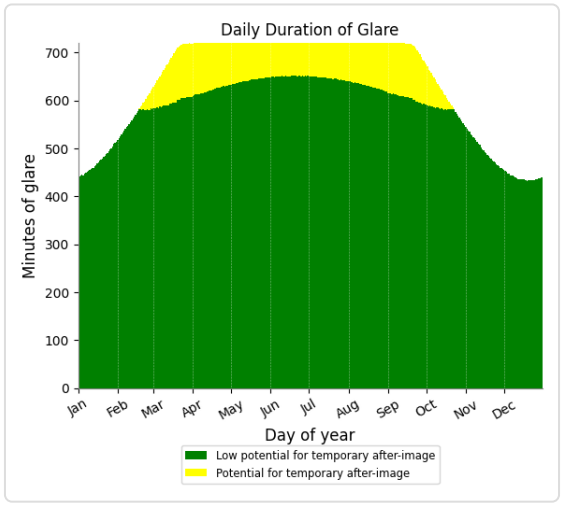


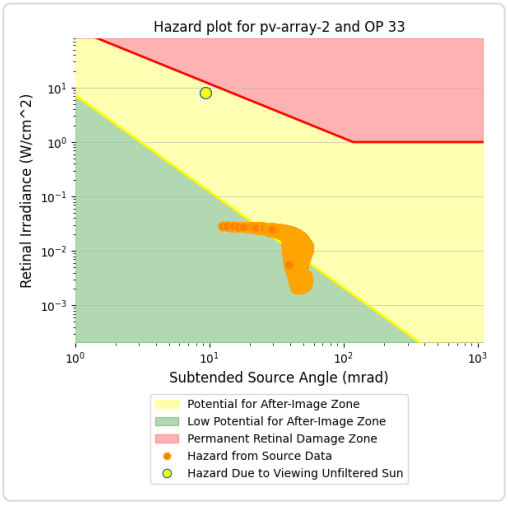
PV array 2 and OP 33

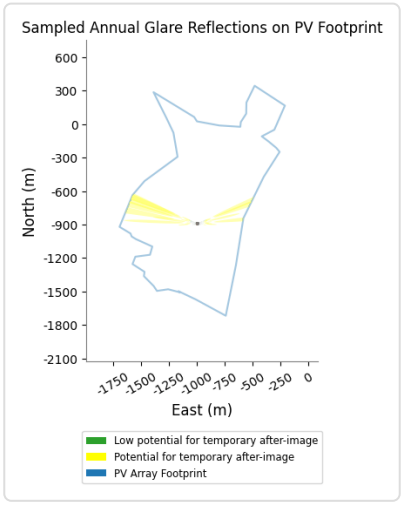
Yellow glare: 20,596 min.

Green glare: 211,069 min.





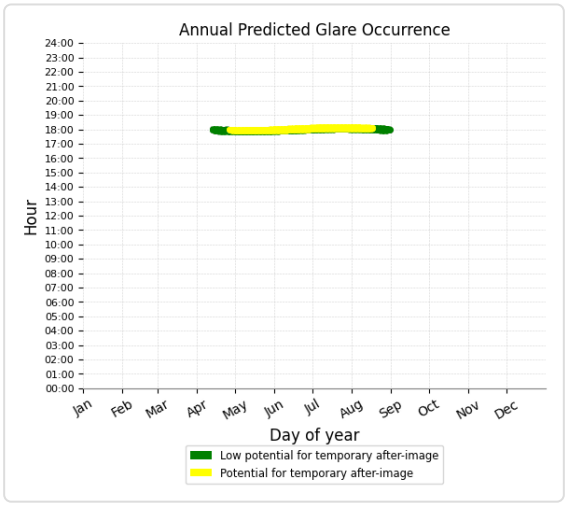


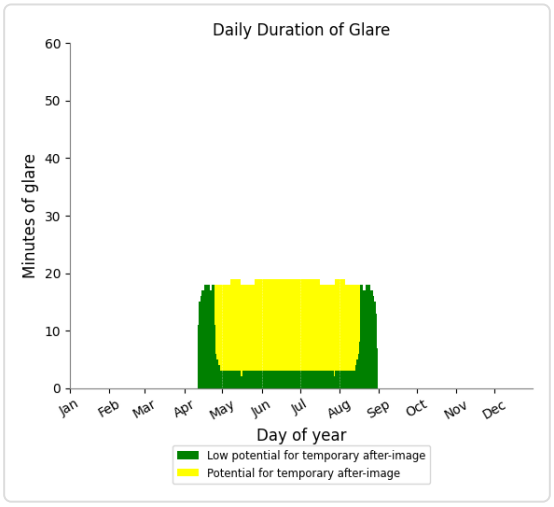


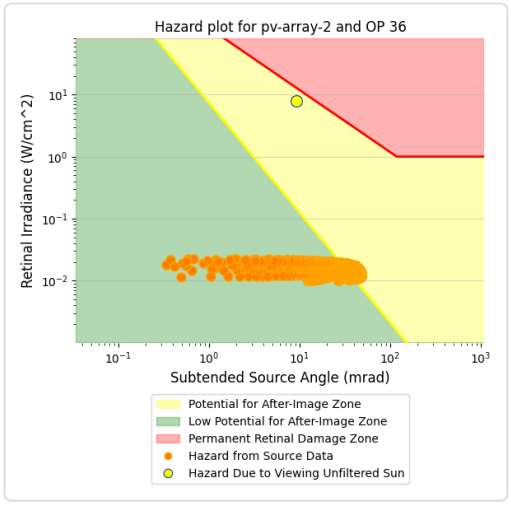
PV array 2 and OP 36

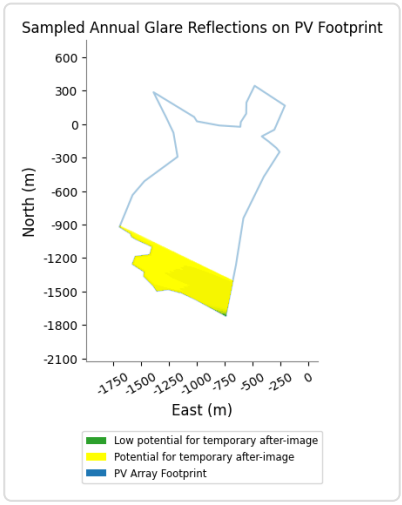
Yellow glare: 1,768 min.

Green glare: 815 min.





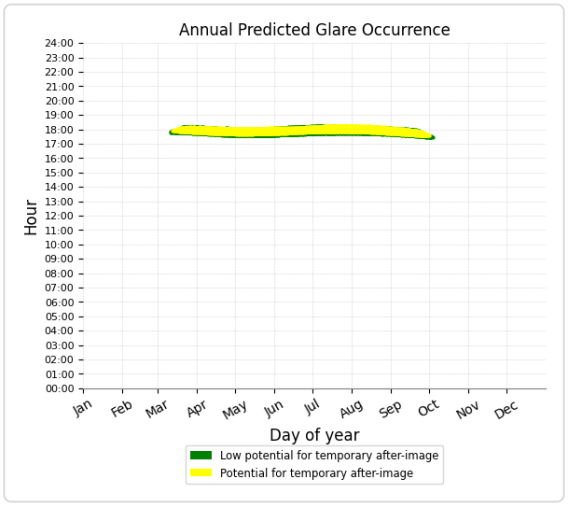


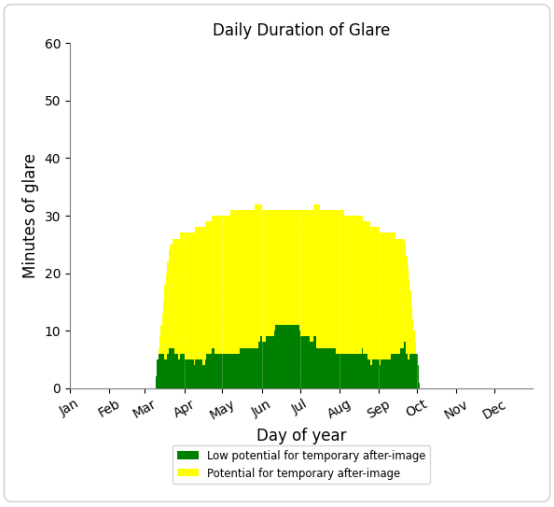


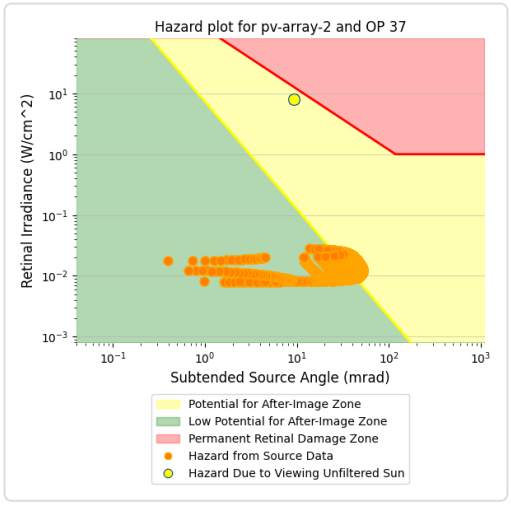
PV array 2 and OP 37

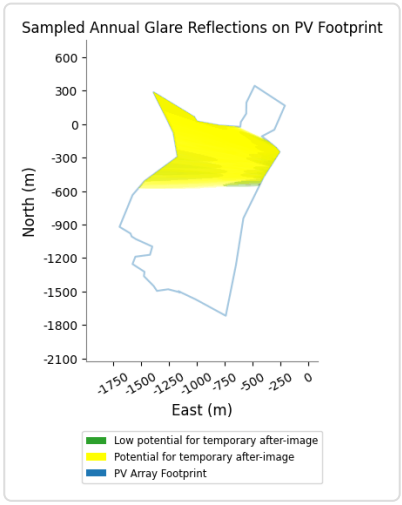
Yellow glare: 4,373 min.

Green glare: 1,405 min.





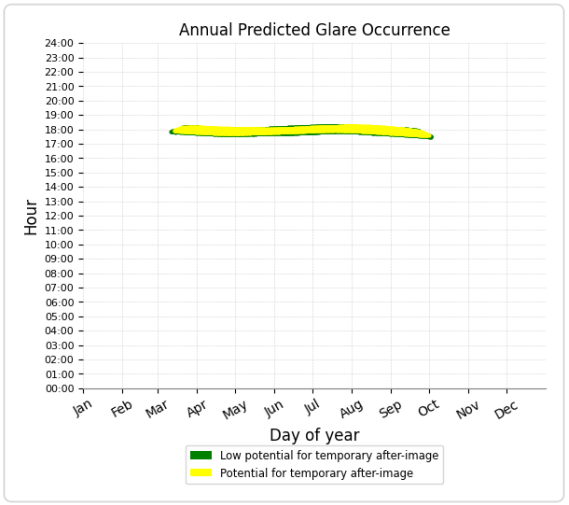


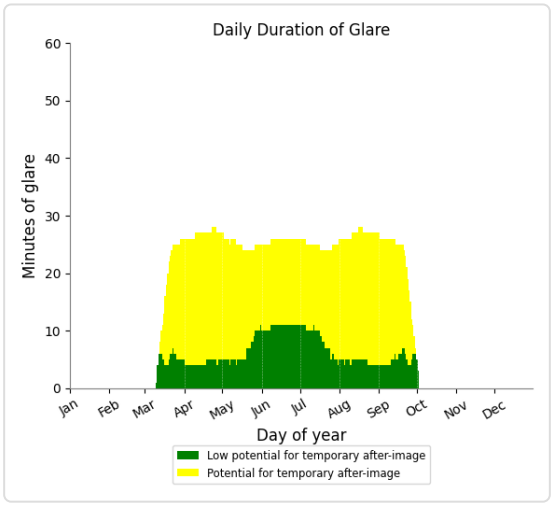


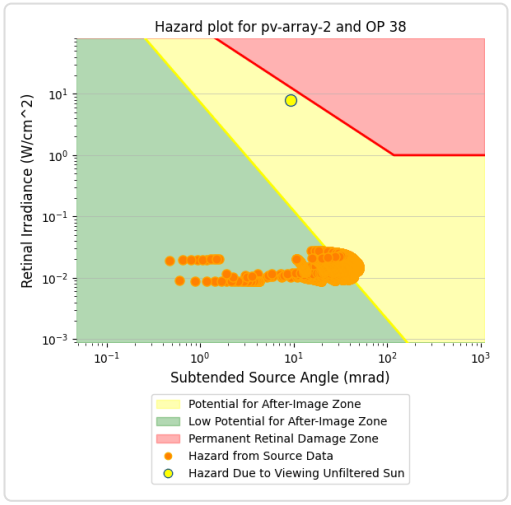
PV array 2 and OP 38

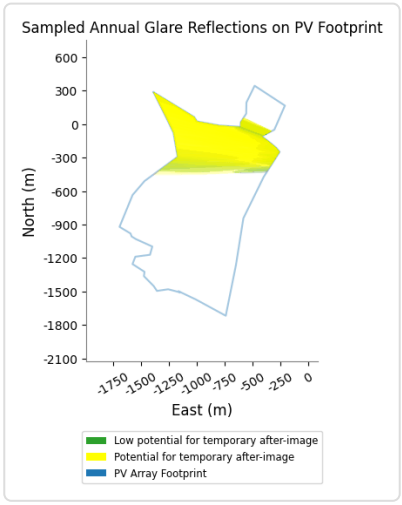
Yellow glare: 3,713 min.

Green glare: 1,328 min.





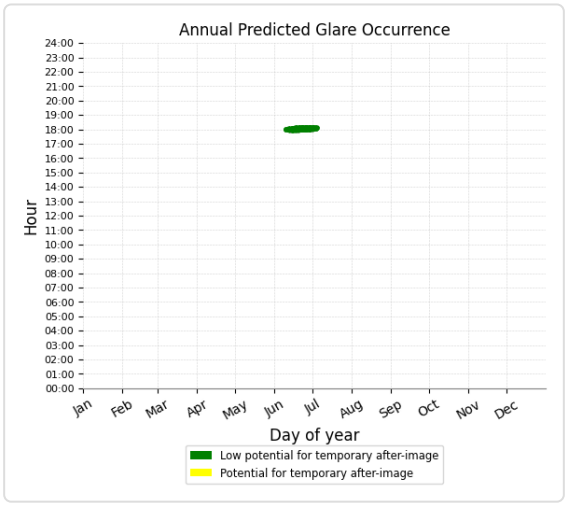


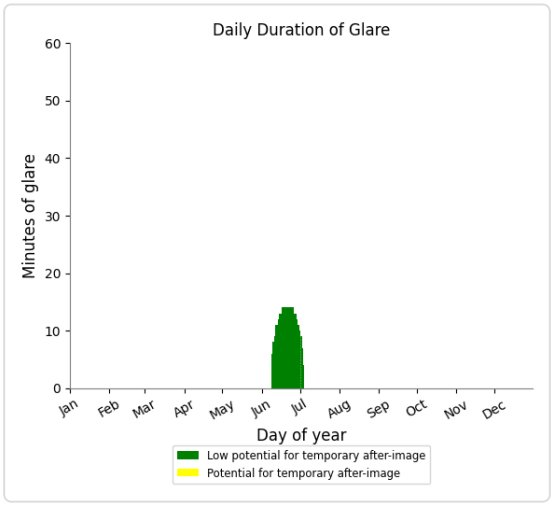


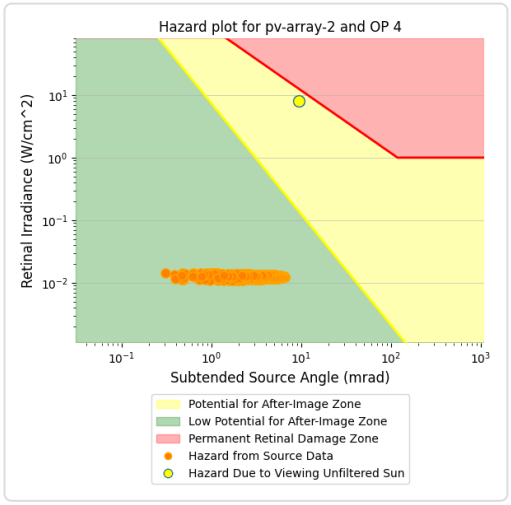
PV array 2 and OP 4

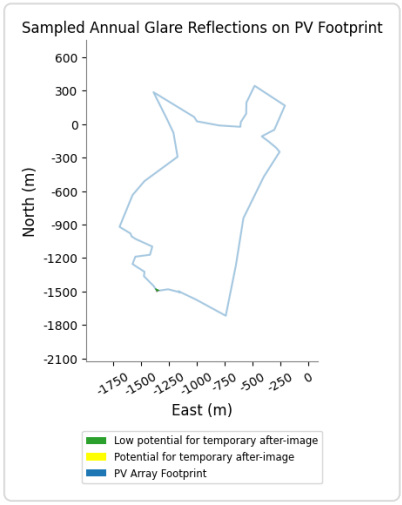
Yellow glare: none

Green glare: 302 min.





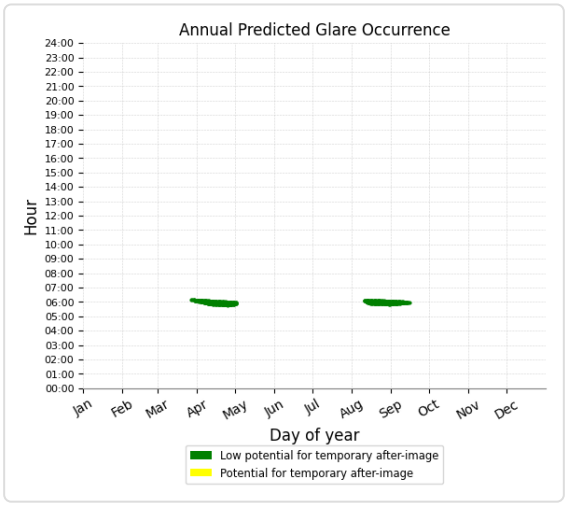


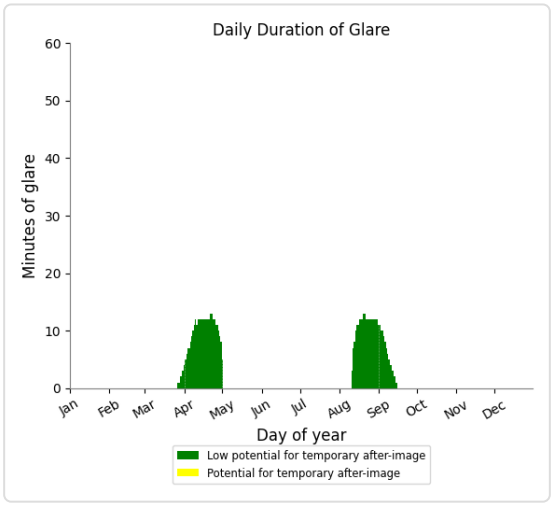


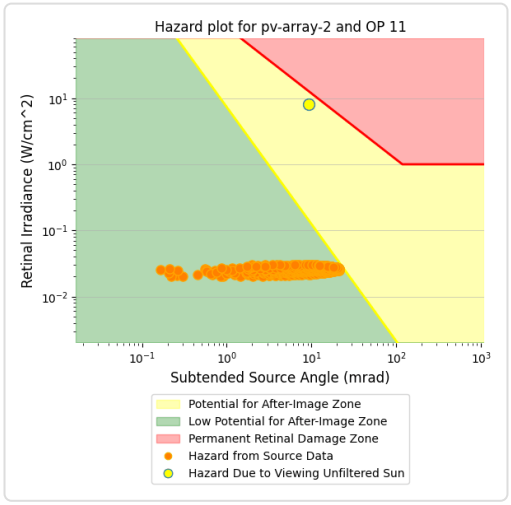
PV array 2 and OP 11

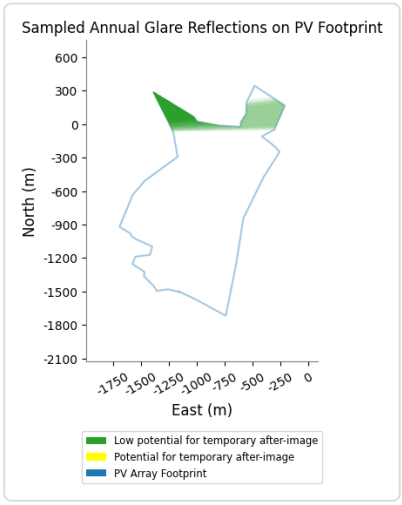
Yellow glare: none

Green glare: 648 min.





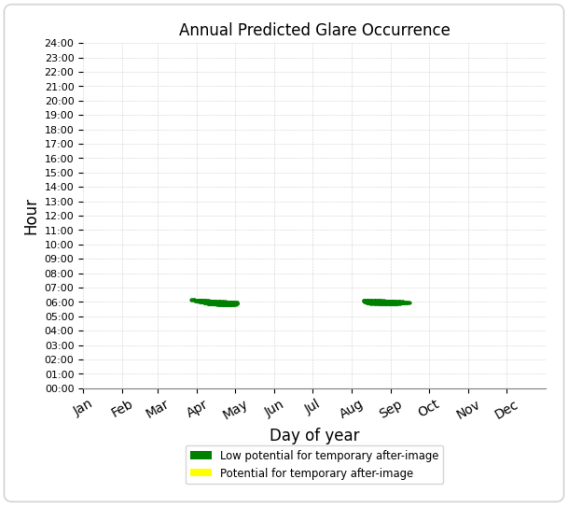


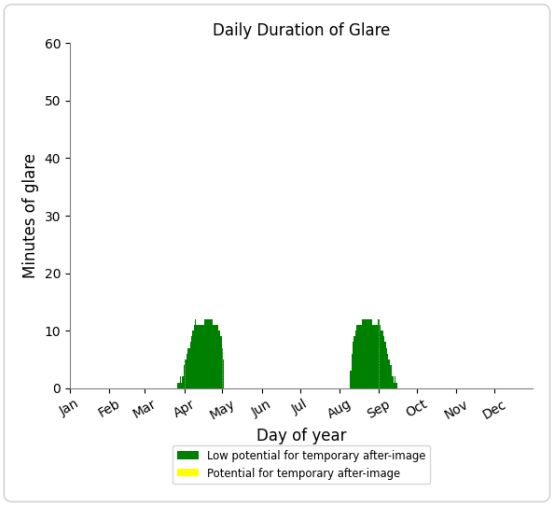


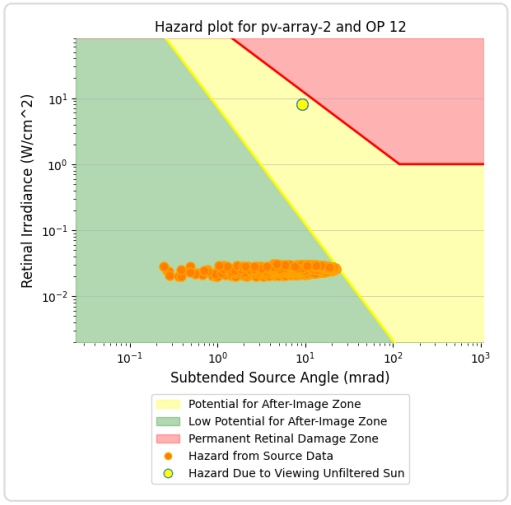
PV array 2 and OP 12

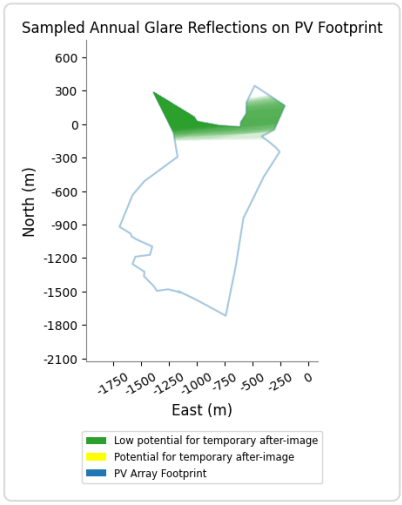
Yellow glare: none

Green glare: 644 min.





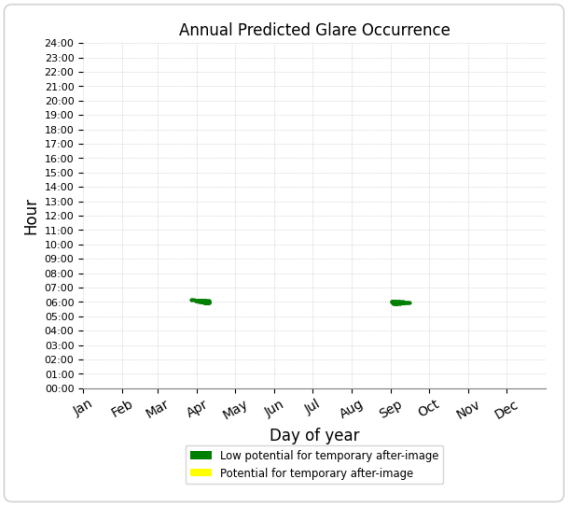


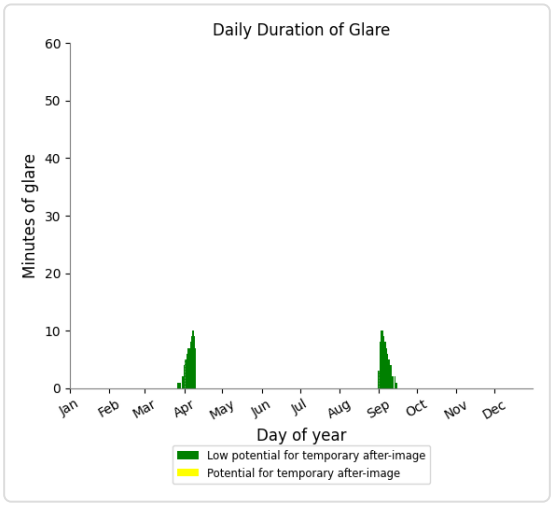


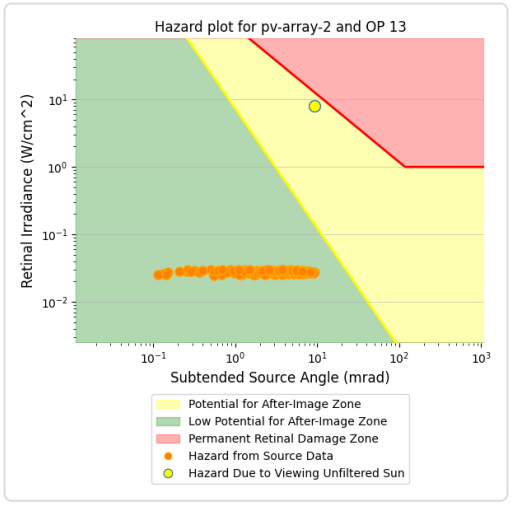
PV array 2 and OP 13

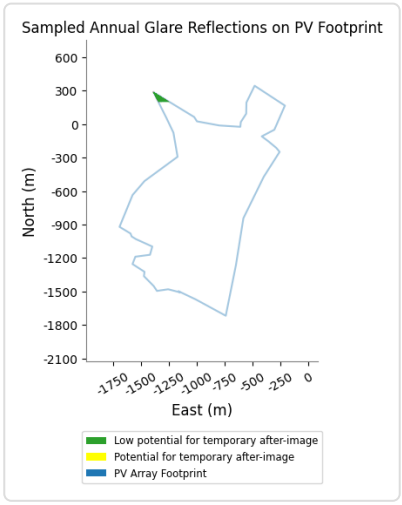
Yellow glare: none

Green glare: 156 min.





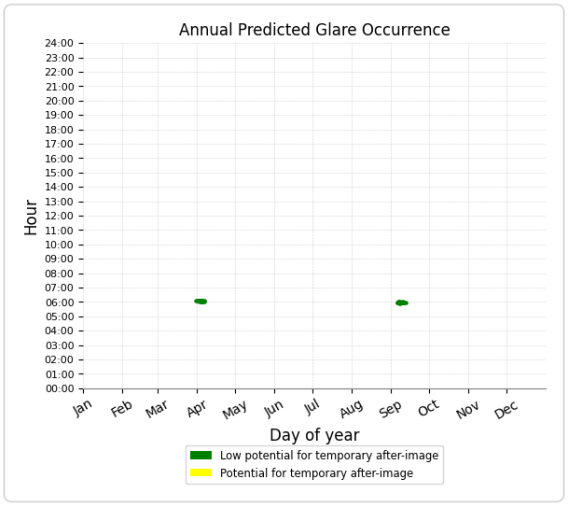


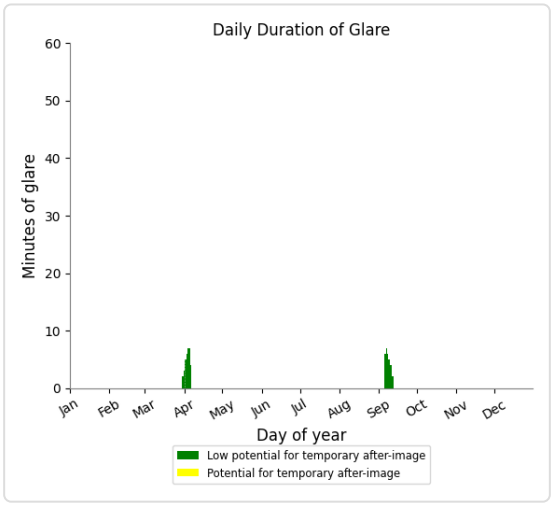


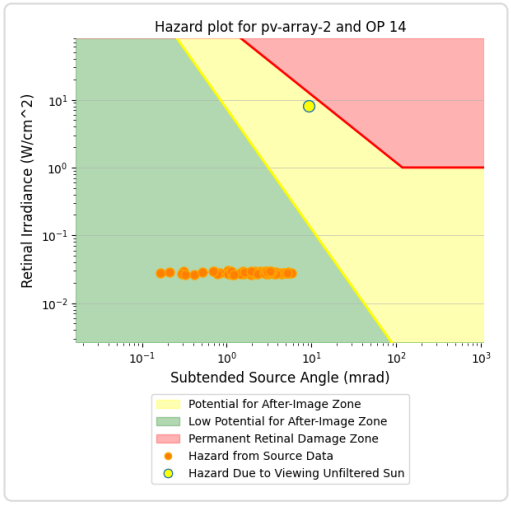
PV array 2 and OP 14

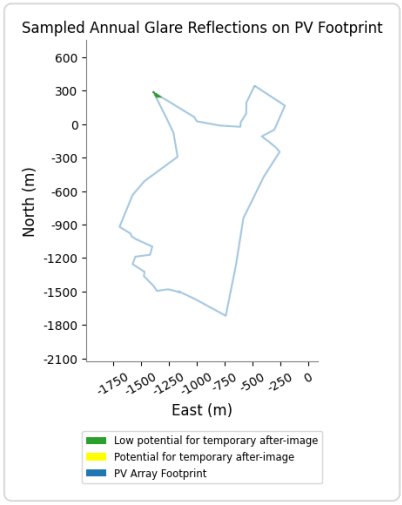
Yellow glare: none

Green glare: 68 min.





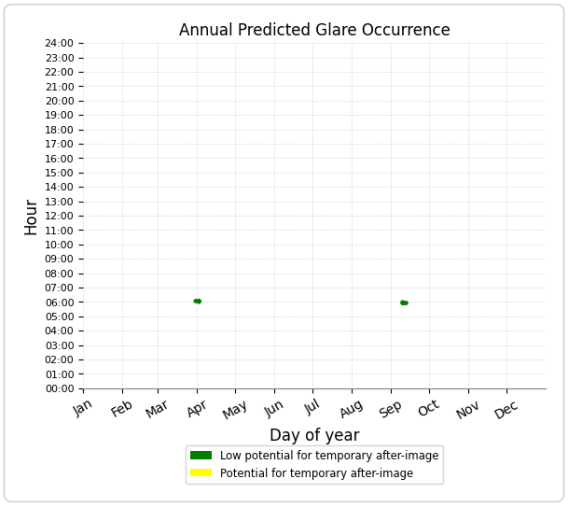


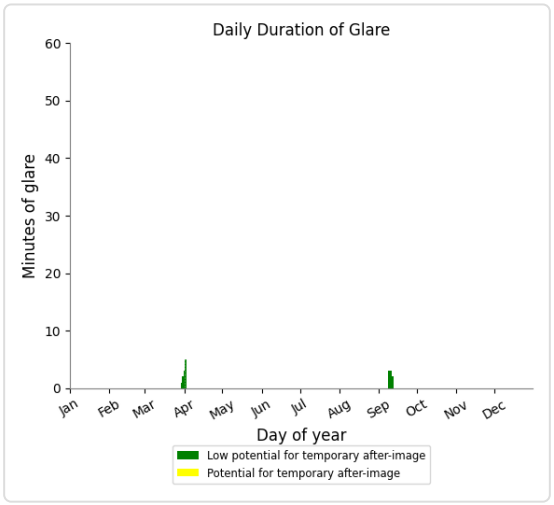


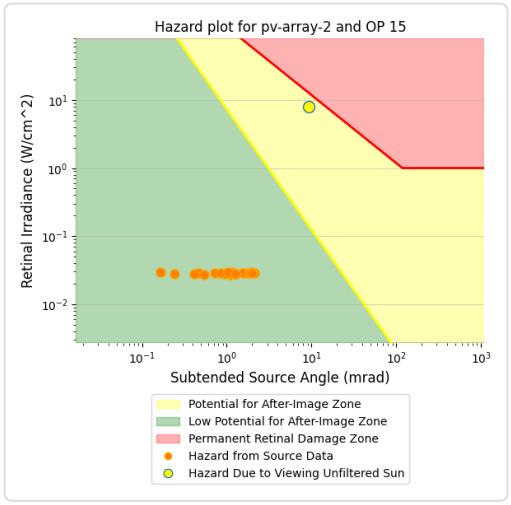
PV array 2 and OP 15

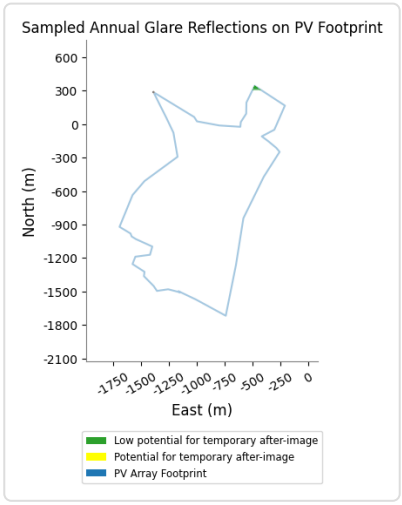
Yellow glare: none

Green glare: 22 min.





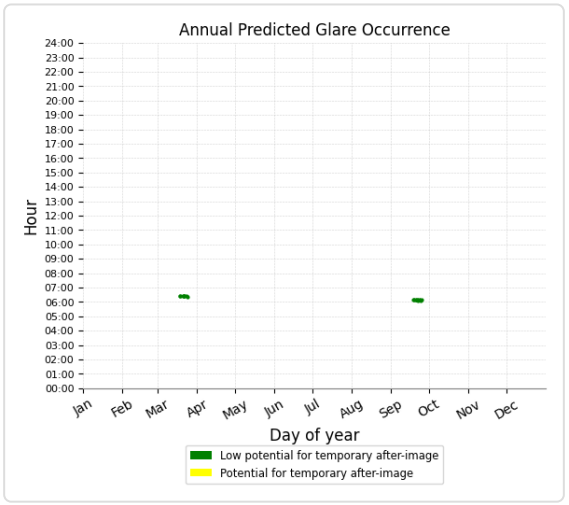


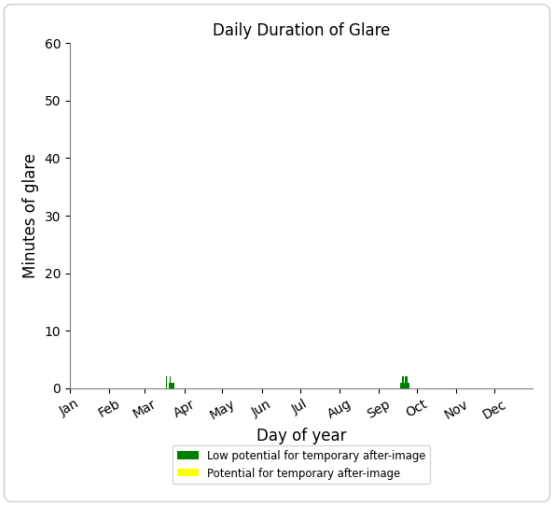


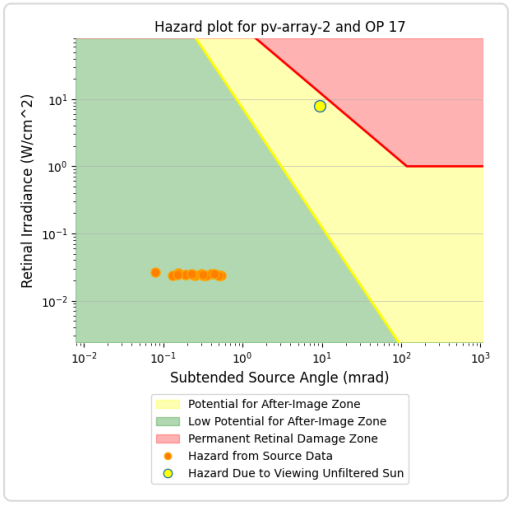
PV array 2 and OP 17

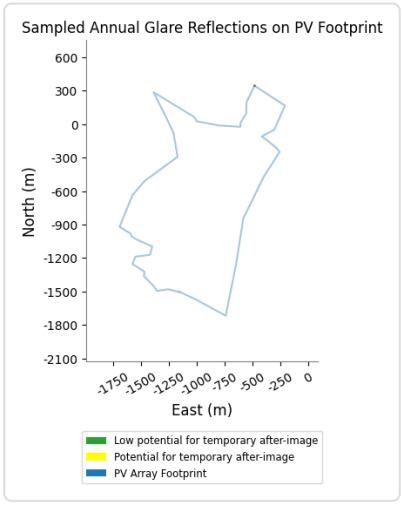
Yellow glare: none

Green glare: 19 min.





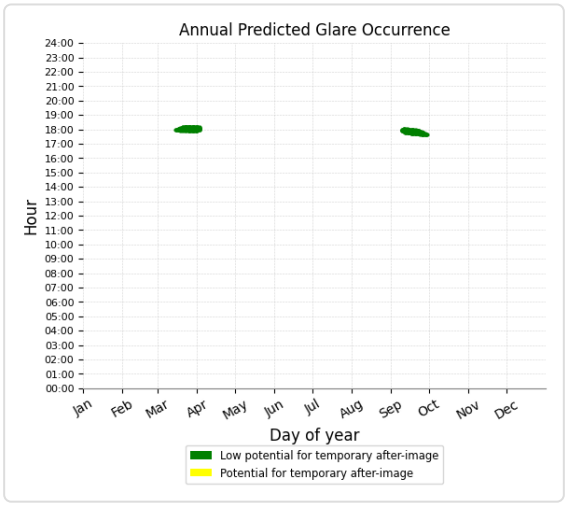


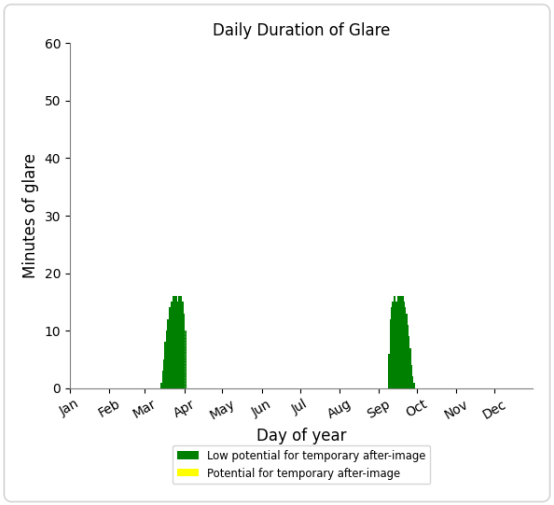


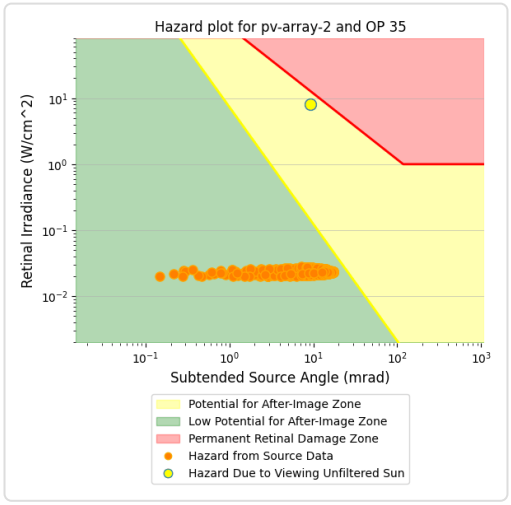
PV array 2 and OP 35

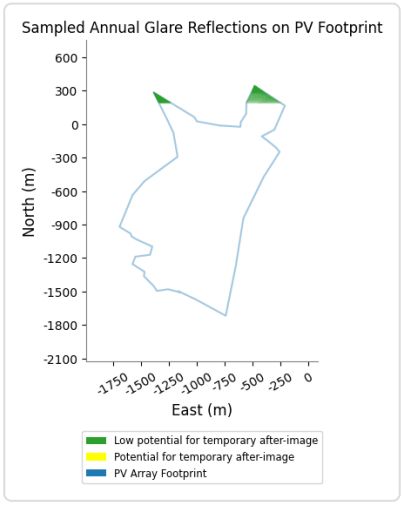
Yellow glare: none

Green glare: 497 min.









PV array 2 and OP 5

No glare found

PV array 2 and OP 16

No glare found

PV array 2 and OP 18

No glare found

PV array 2 and OP 19

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 21

No glare found

PV array 2 and OP 23

No glare found

PV array 2 and OP 24

No glare found

PV array 2 and OP 25

No glare found

PV array 2 and OP 26

No glare found

PV array 2 and OP 27

No glare found

PV array 2 and OP 28

No glare found

PV array 2 and OP 34

No glare found

PV: PV array 3 potential temporary after-image

Receptor results ordered by category of glare

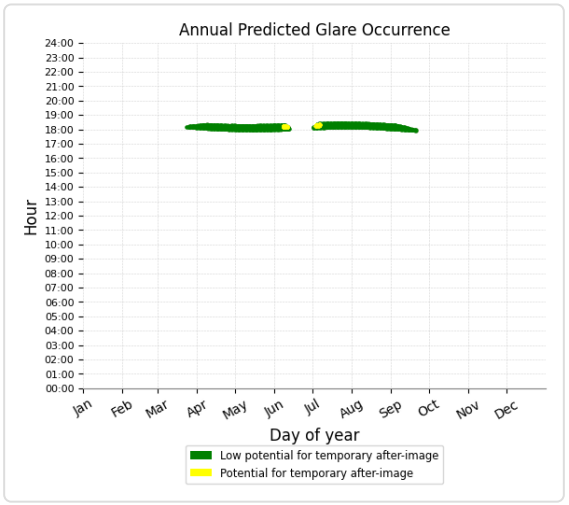
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
M18	2,414	40.2	54	0.9
Arbour lane	1,680	28.0	0	0.0
B6093	0	0.0	0	0.0
B6094 and Ruddle Lane	0	0.0	0	0.0
OP 29	480	8.0	1,910	31.8
OP 30	1,553	25.9	2,104	35.1
OP 37	2,066	34.4	201	3.4
OP 38	1,074	17.9	2,416	40.3
OP 7	1,695	28.2	0	0.0
OP 8	1,134	18.9	0	0.0
OP 9	1,047	17.4	0	0.0
OP 10	461	7.7	0	0.0
OP 11	26	0.4	0	0.0
OP 12	115	1.9	0	0.0
OP 31	1,566	26.1	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0

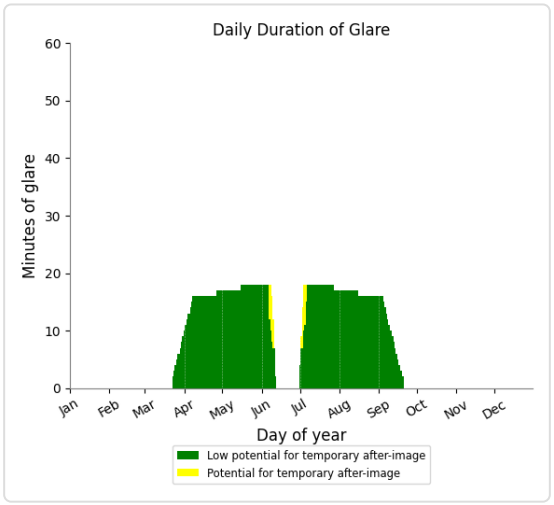
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0

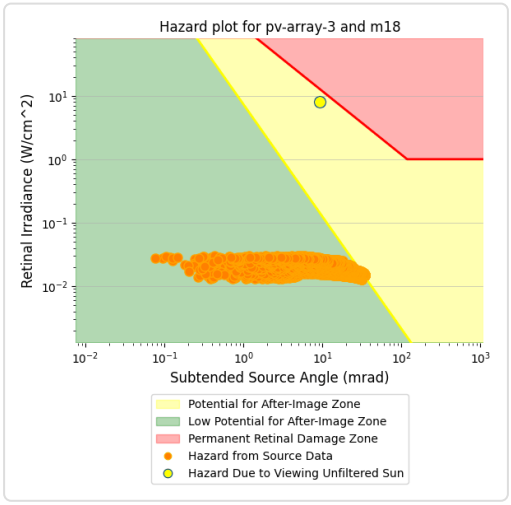
PV array 3 and Route: M18

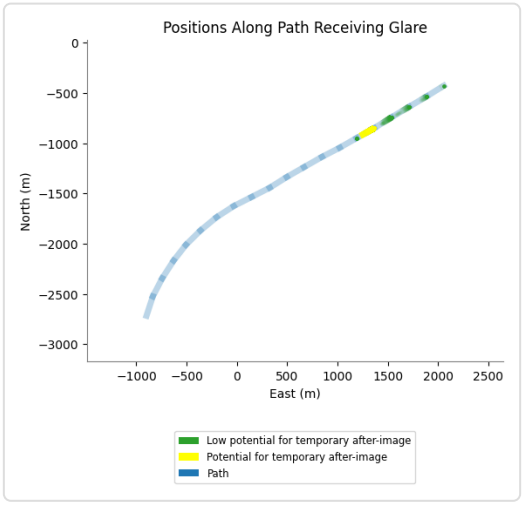
Yellow glare: 54 min.

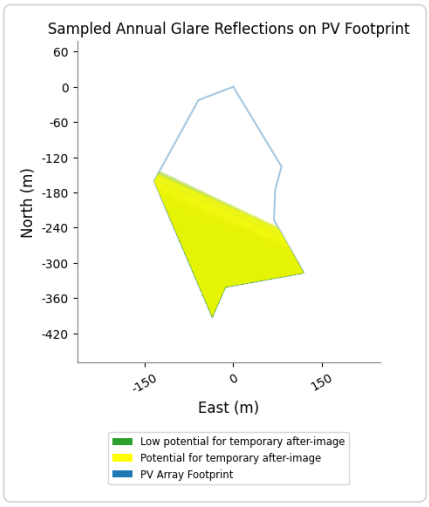
Green glare: 2,414 min.







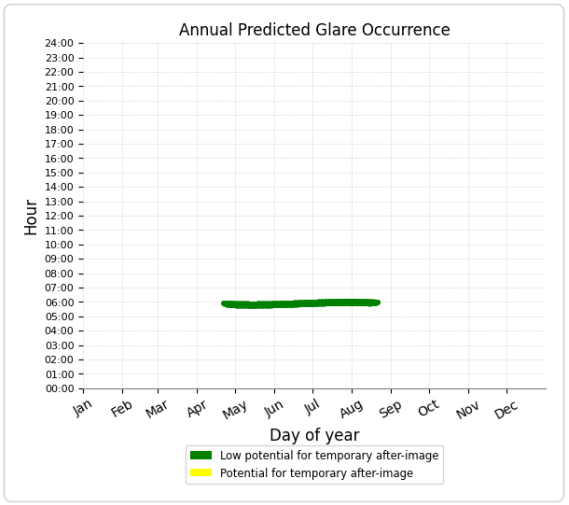


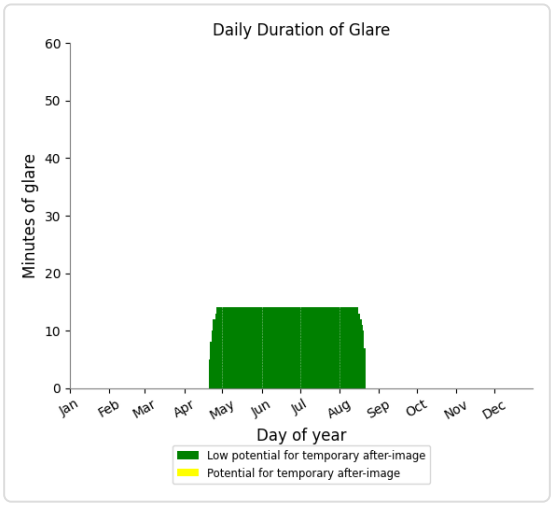


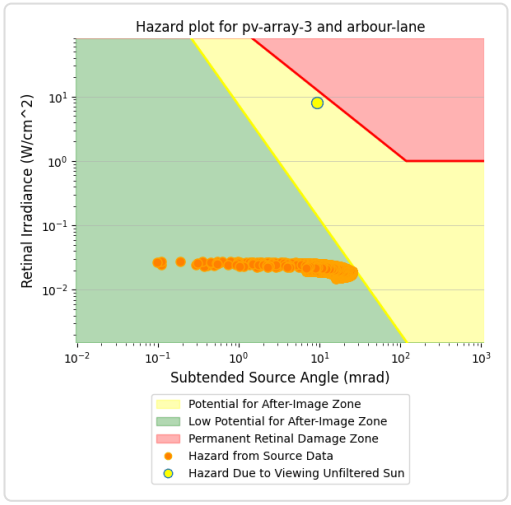
PV array 3 and Route: Arbour lane

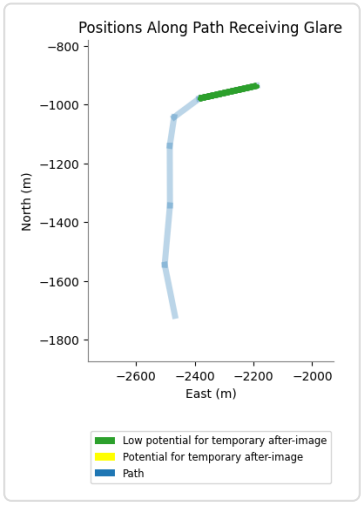
Yellow glare: none

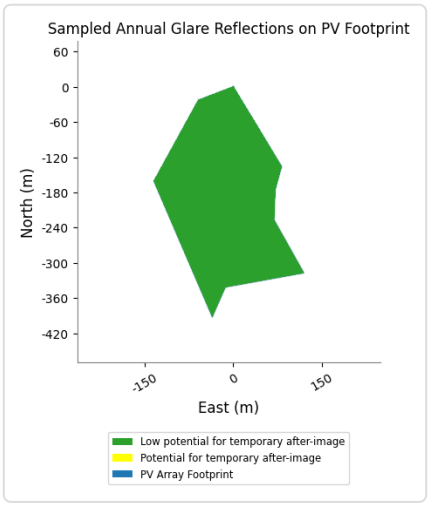
Green glare: 1,680 min.











PV array 3 and Route: B6093

No glare found

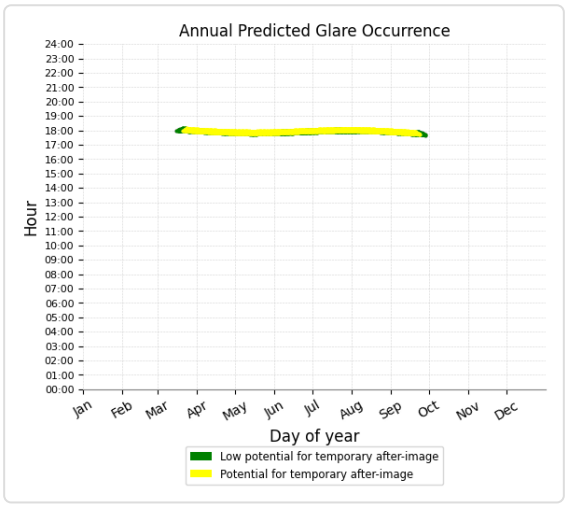
PV array 3 and Route: B6094 and Ruddle Lane

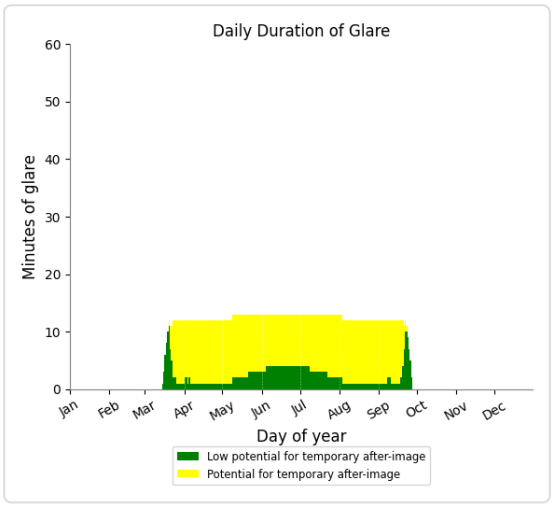
No glare found

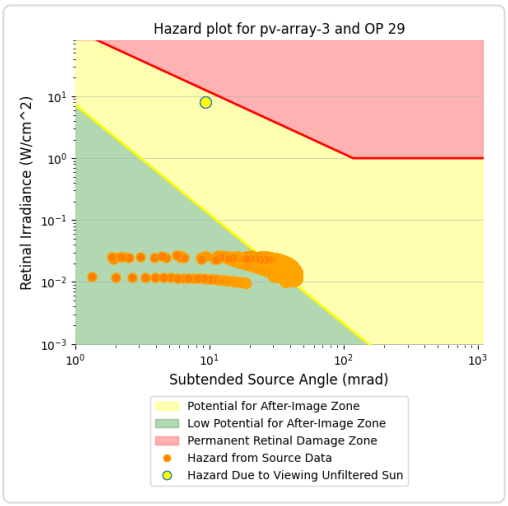
PV array 3 and OP 29

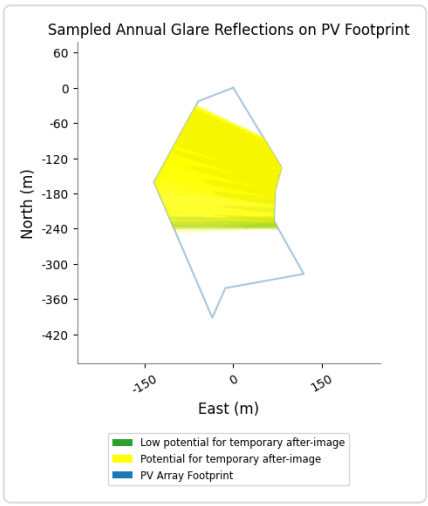
Yellow glare: 1,910 min.

Green glare: 480 min.





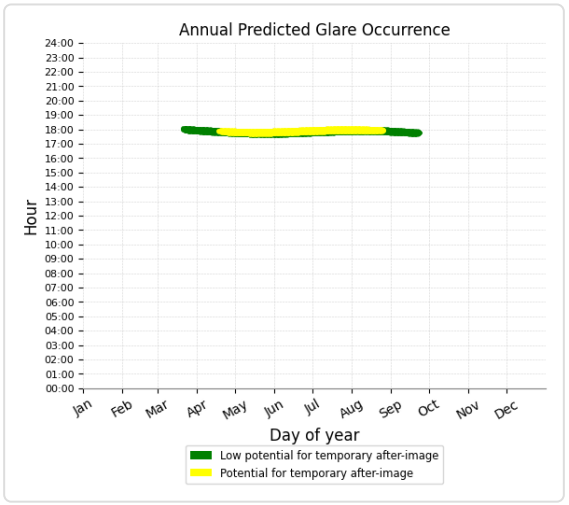


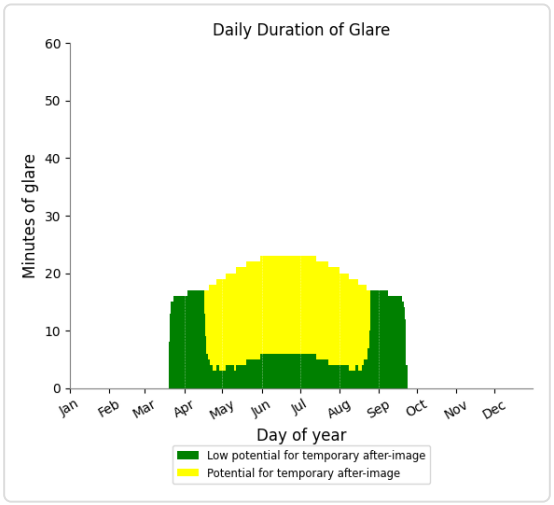


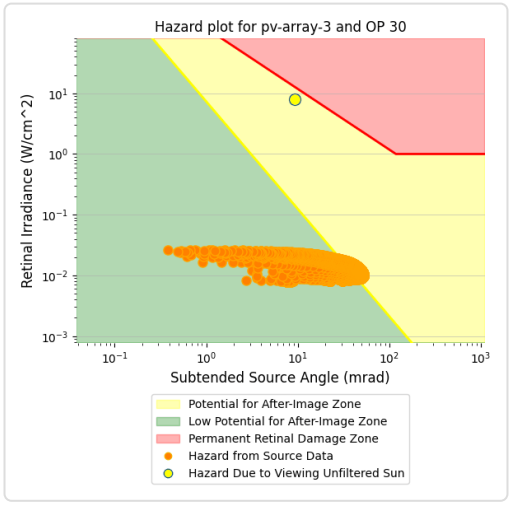
PV array 3 and OP 30

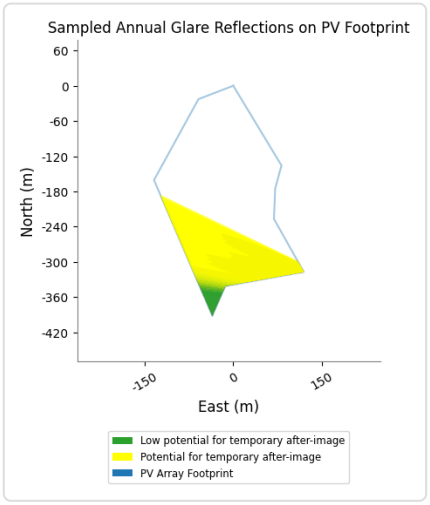
Yellow glare: 2,104 min.

Green glare: 1,553 min.





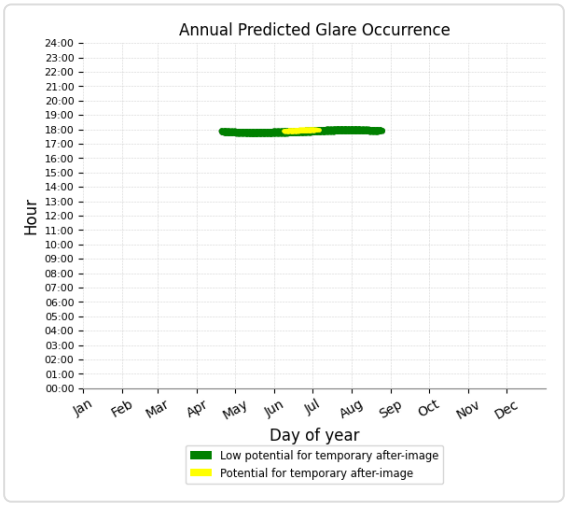


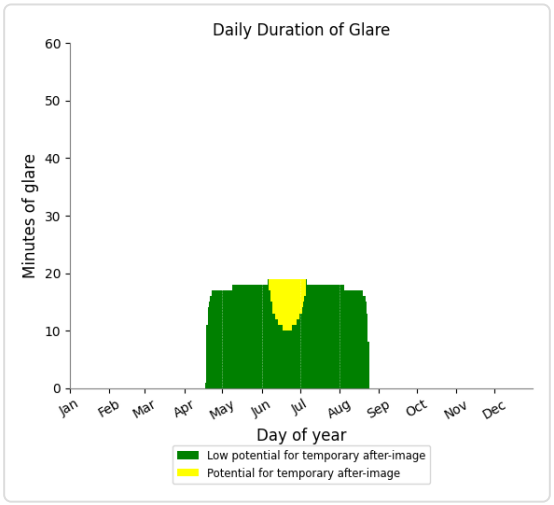


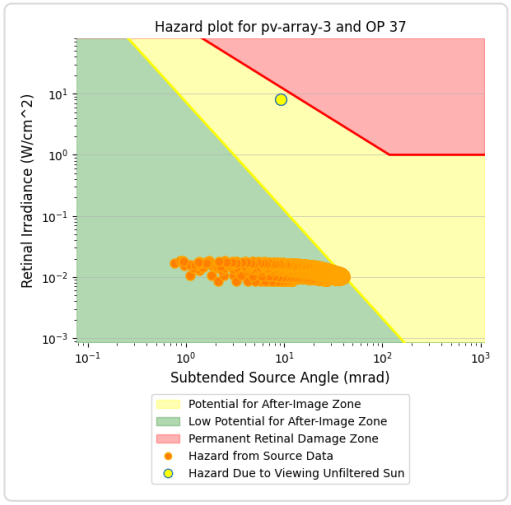
PV array 3 and OP 37

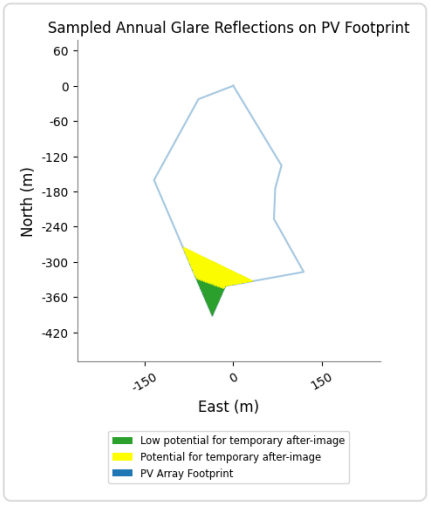
Yellow glare: 201 min.

Green glare: 2,066 min.





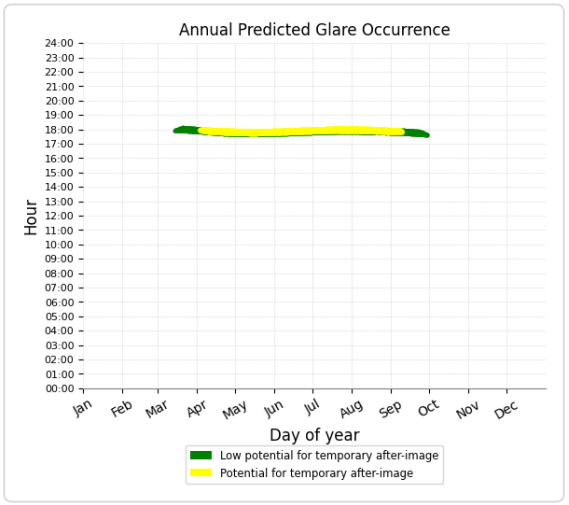


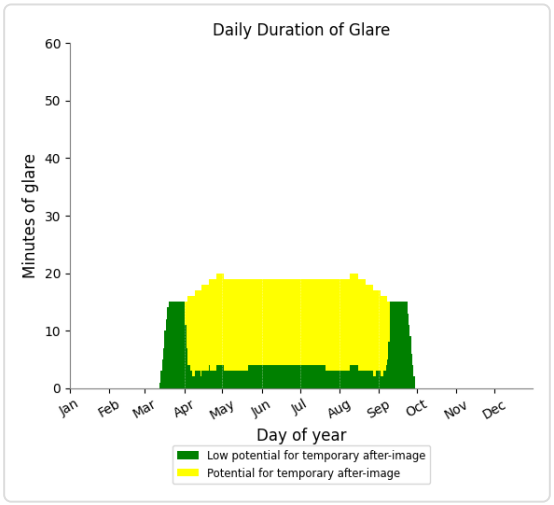


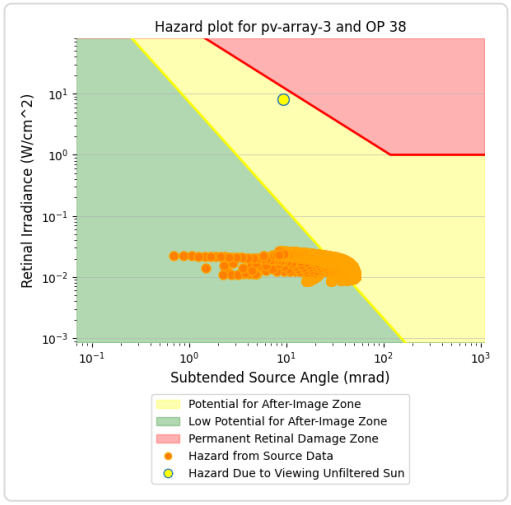
PV array 3 and OP 38

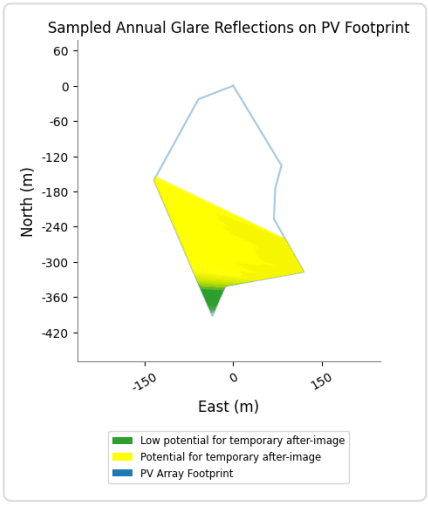
Yellow glare: 2,416 min.

Green glare: 1,074 min.





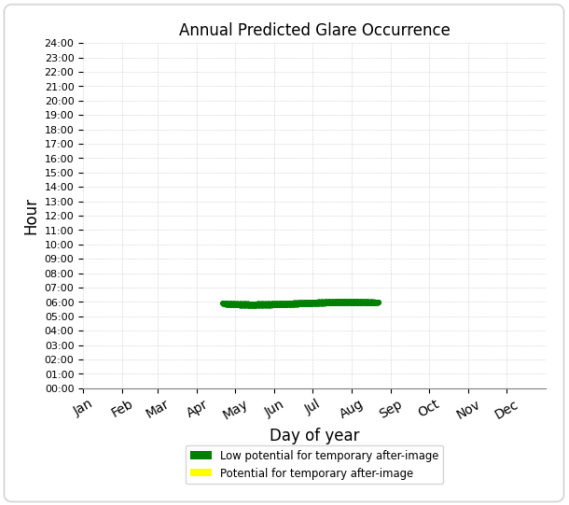


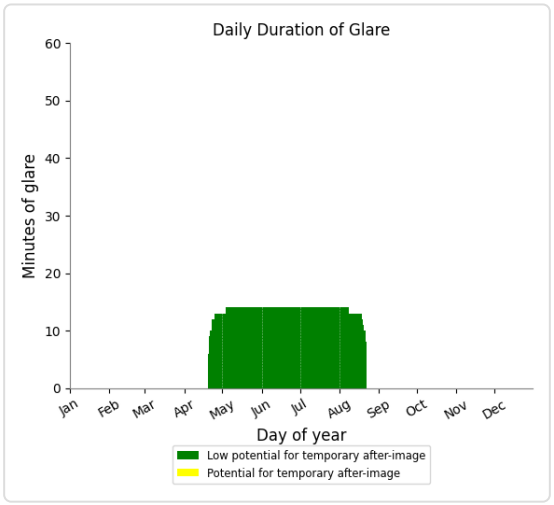


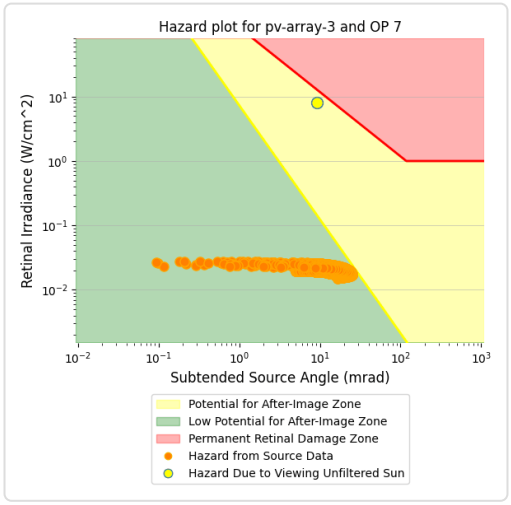
PV array 3 and OP 7

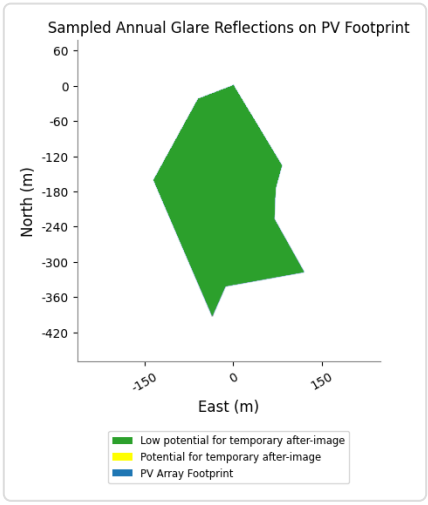
Yellow glare: none

Green glare: 1,695 min.





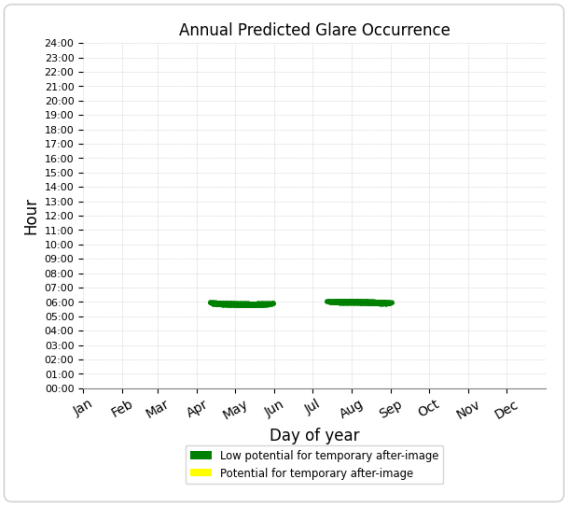


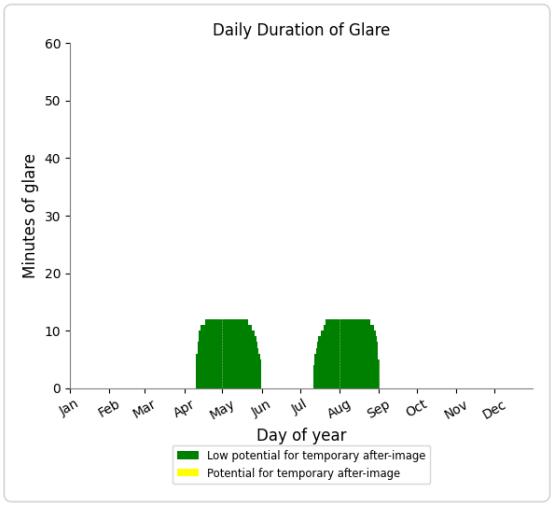


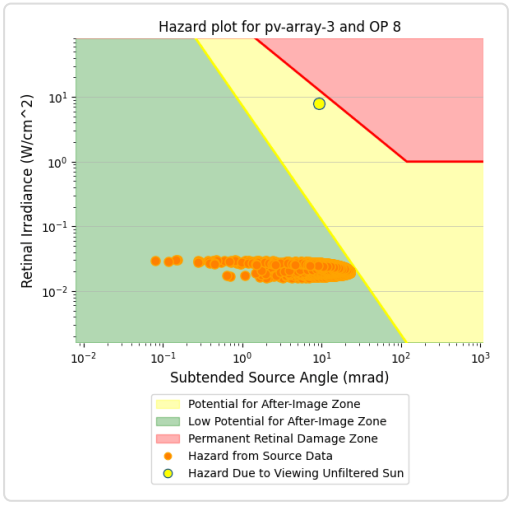
PV array 3 and OP 8

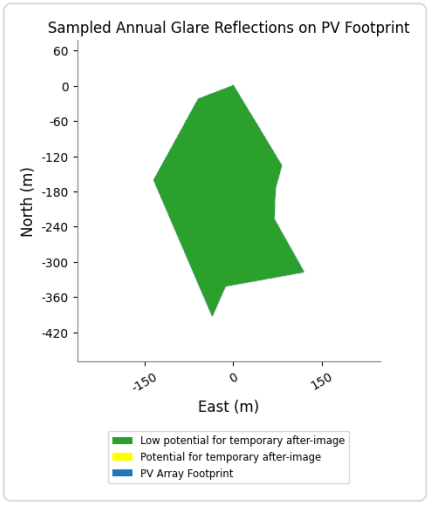
Yellow glare: none

Green glare: 1,134 min.





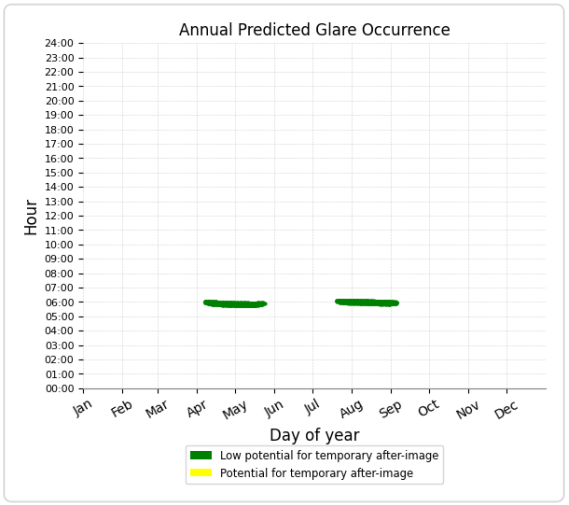


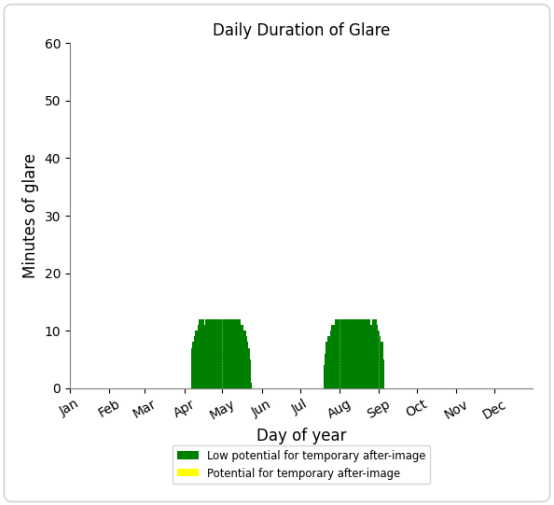


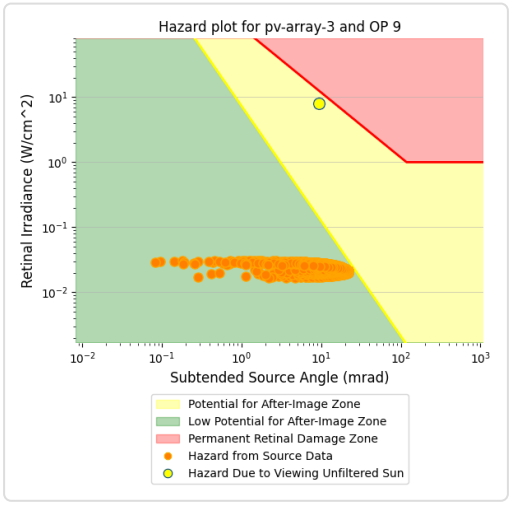
PV array 3 and OP 9

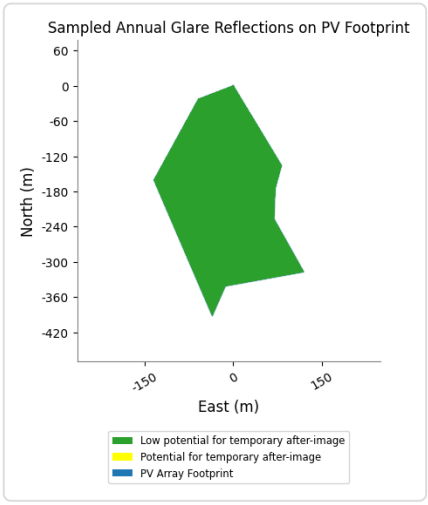
Yellow glare: none

Green glare: 1,047 min.





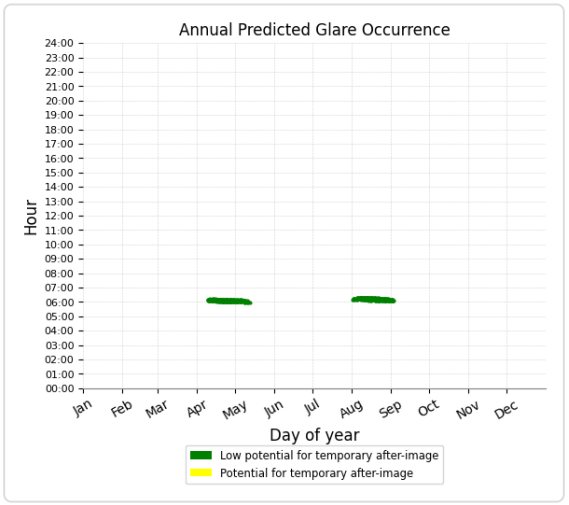


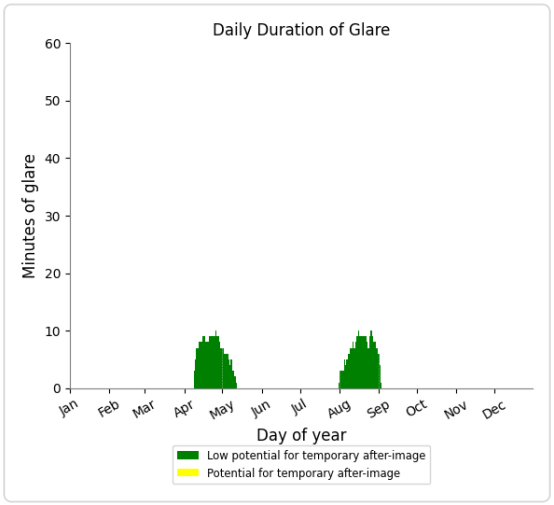


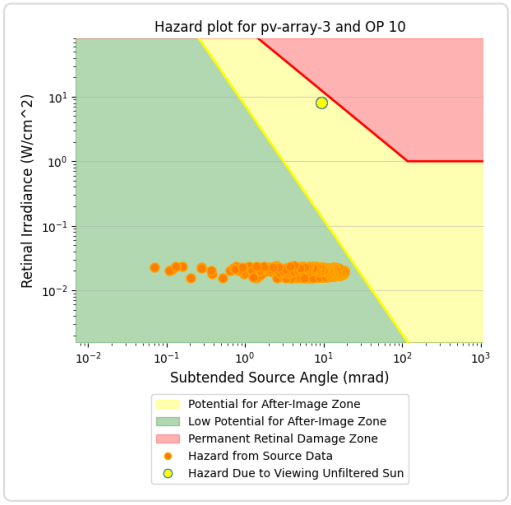
PV array 3 and OP 10

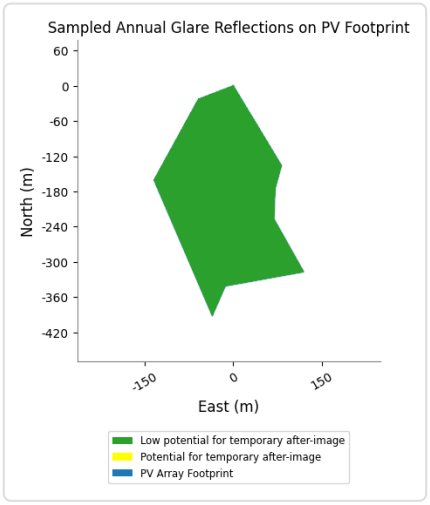
Yellow glare: none

Green glare: 461 min.





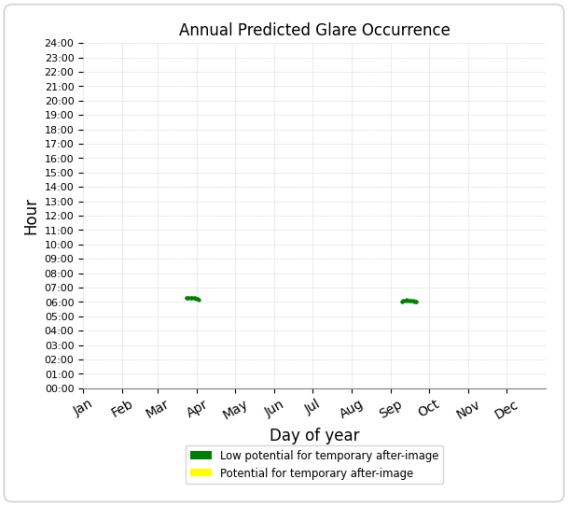


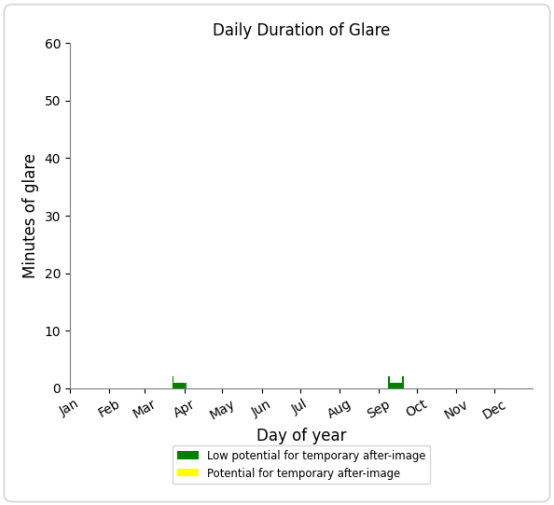


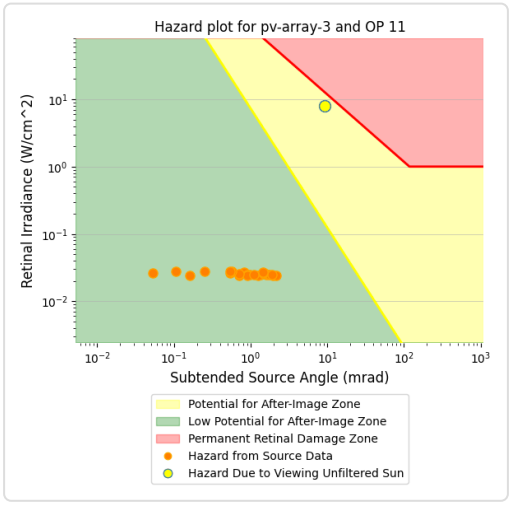
PV array 3 and OP 11

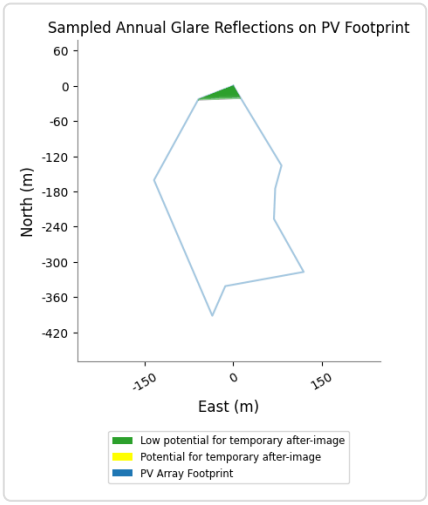
Yellow glare: none

Green glare: 26 min.





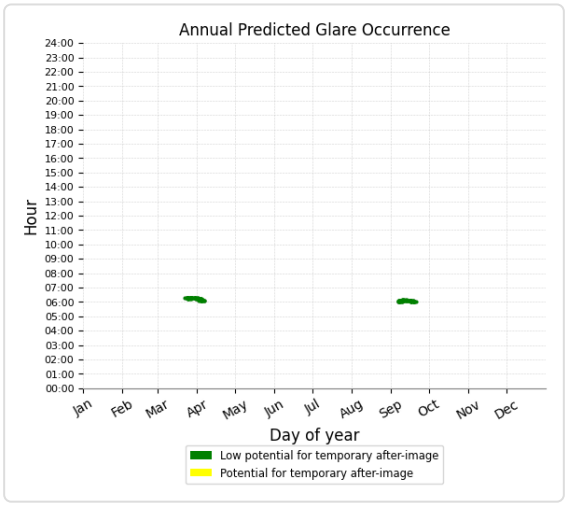


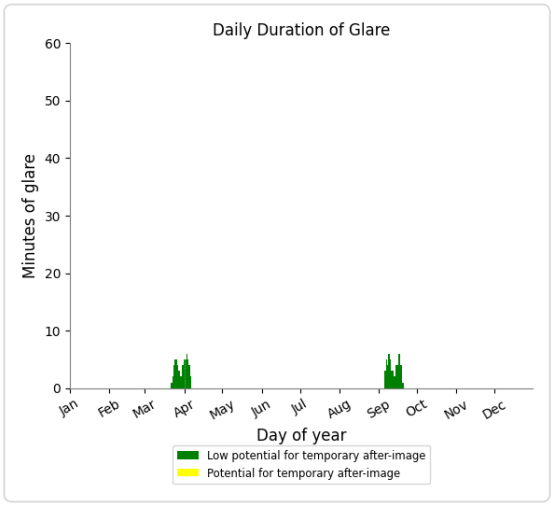


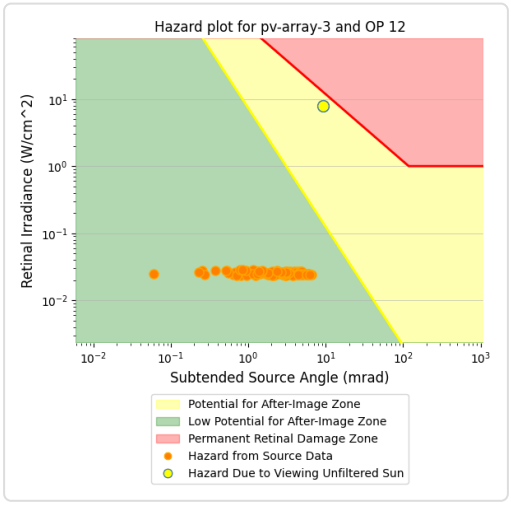
PV array 3 and OP 12

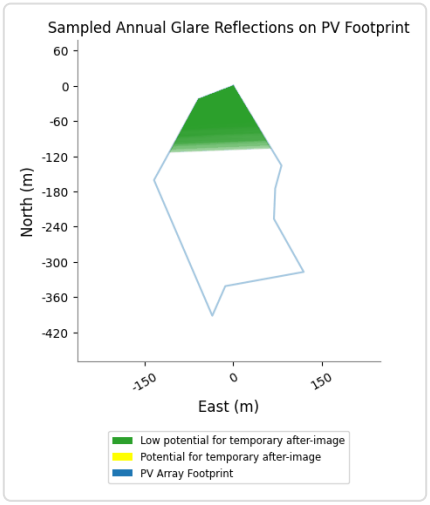
Yellow glare: none

Green glare: 115 min.





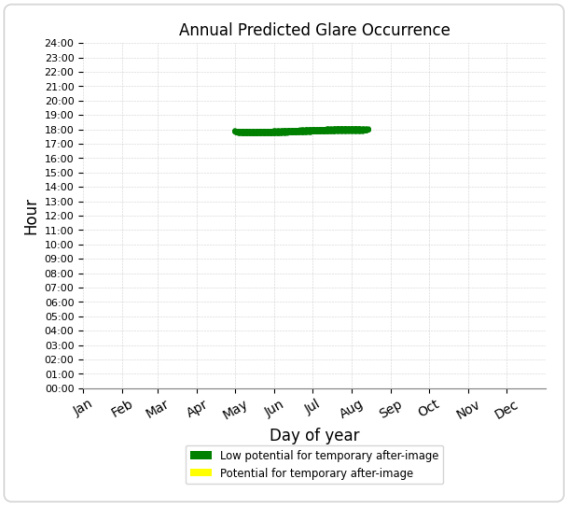


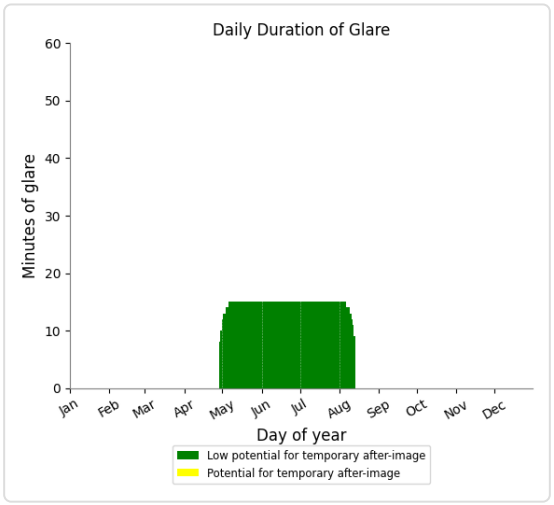


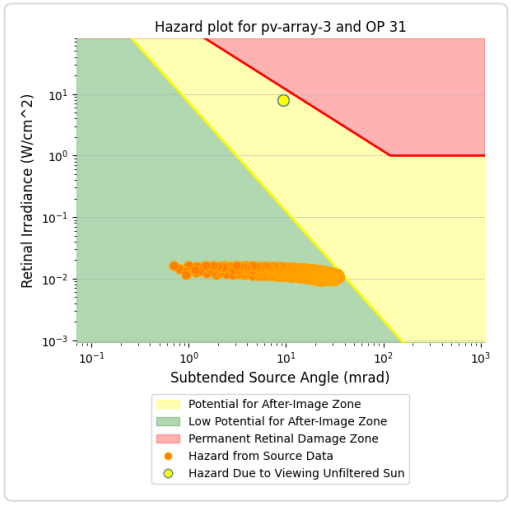
PV array 3 and OP 31

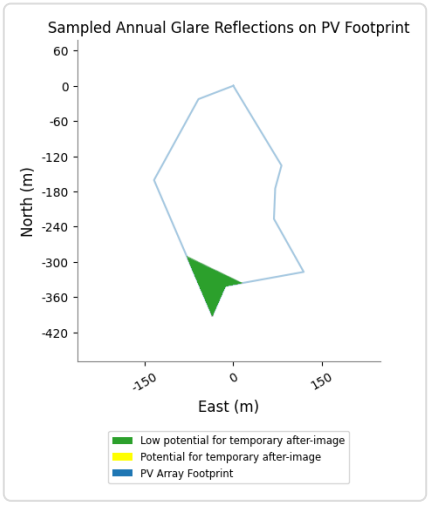
Yellow glare: none

Green glare: 1,566 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 13

No glare found

PV array 3 and OP 14

No glare found

PV array 3 and OP 15

No glare found

PV array 3 and OP 16

No glare found

PV array 3 and OP 17

No glare found

PV array 3 and OP 18

No glare found

PV array 3 and OP 19

No glare found

PV array 3 and OP 20

No glare found

PV array 3 and OP 21

No glare found

PV array 3 and OP 22

No glare found

PV array 3 and OP 23

No glare found

PV array 3 and OP 24

No glare found

PV array 3 and OP 25

No glare found

PV array 3 and OP 26

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 32

No glare found

PV array 3 and OP 33

No glare found

PV array 3 and OP 34

No glare found

PV array 3 and OP 35

No glare found

PV array 3 and OP 36

No glare found

PV: PV array 4 potential temporary after-image

Receptor results ordered by category of glare

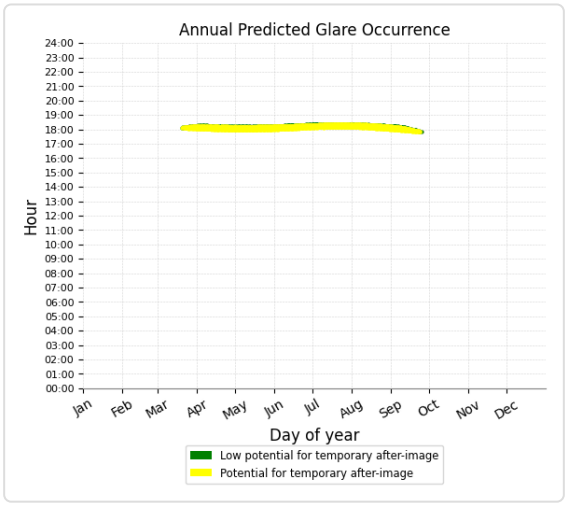
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
B6094 and Ruddle Lane	296	4.9	2,363	39.4
M18	1,876	31.3	1,905	31.8
Arbour lane	1,362	22.7	0	0.0
B6093	0	0.0	0	0.0
OP 31	419	7.0	180	3.0
OP 32	787	13.1	133	2.2
OP 33	644	10.7	2,490	41.5
OP 37	359	6.0	3	0.1
OP 6	422	7.0	0	0.0
OP 7	984	16.4	0	0.0
OP 8	710	11.8	0	0.0
OP 9	532	8.9	0	0.0
OP 10	836	13.9	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 34	0	0.0	0	0.0

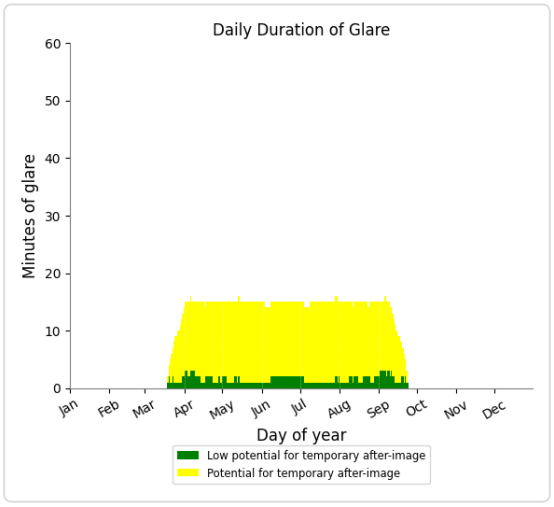
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 38	0	0.0	0	0.0

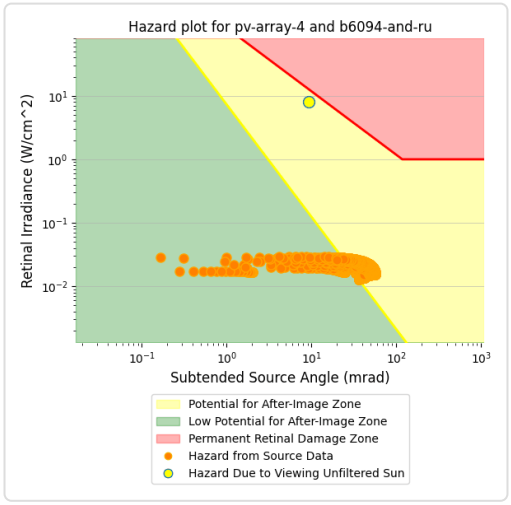
PV array 4 and Route: B6094 and Ruddle Lane

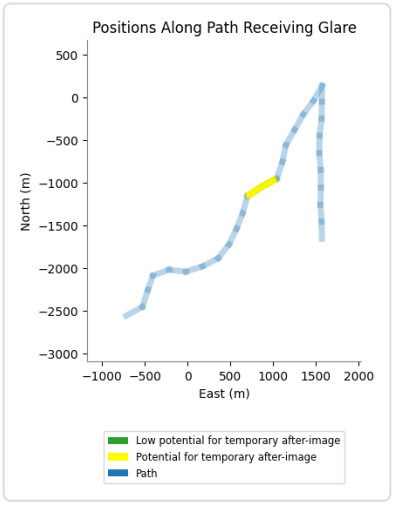
Yellow glare: 2,363 min.

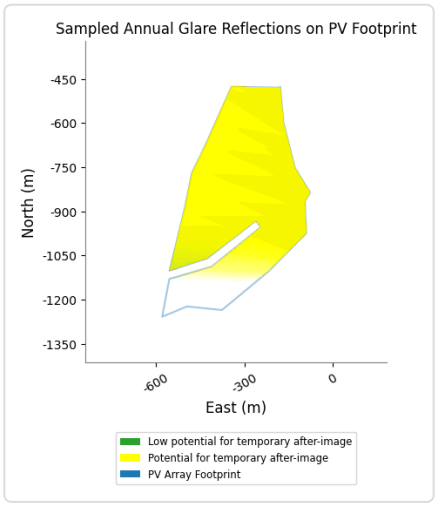
Green glare: 296 min.







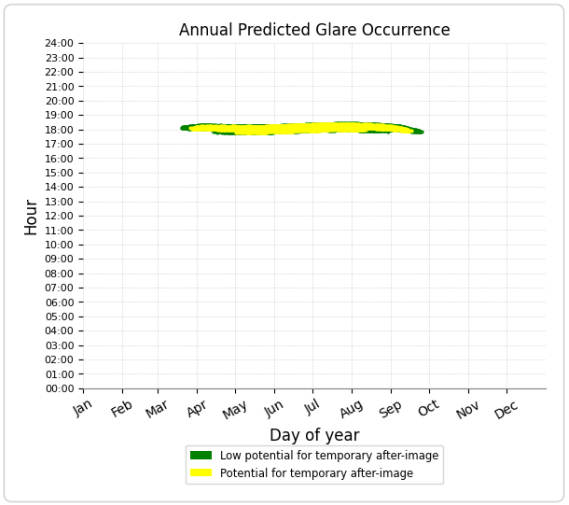


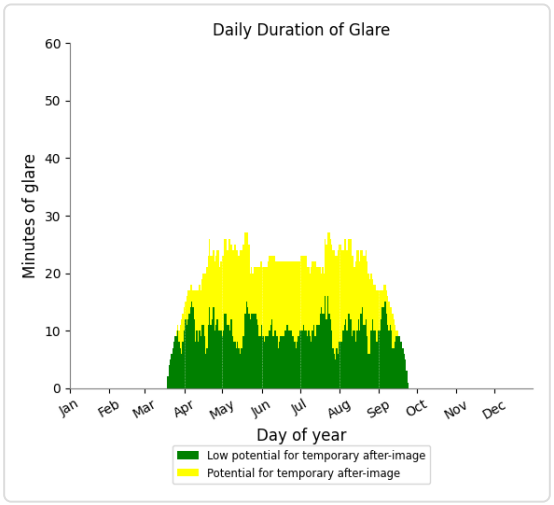


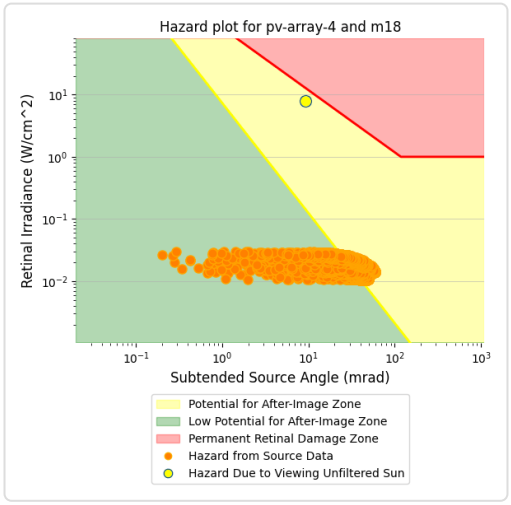
PV array 4 and Route: M18

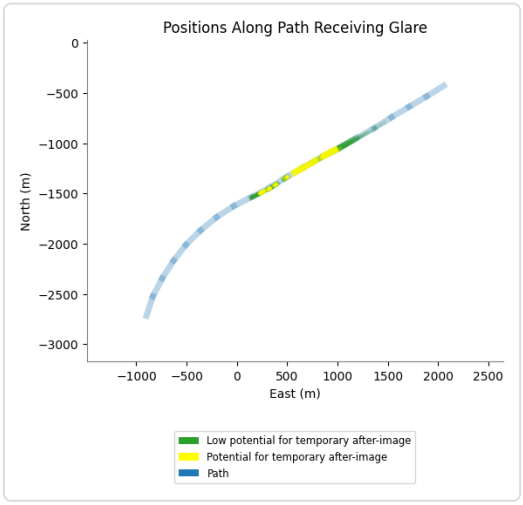
Yellow glare: 1,905 min.

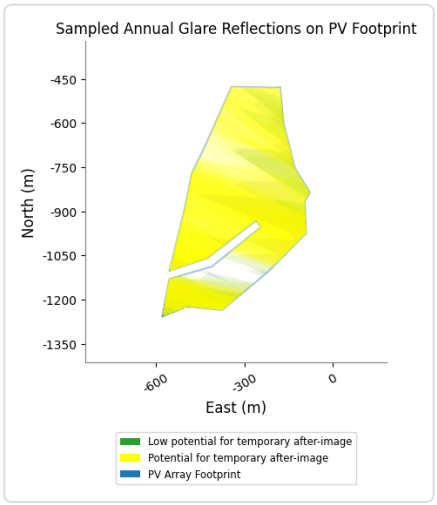
Green glare: 1,876 min.







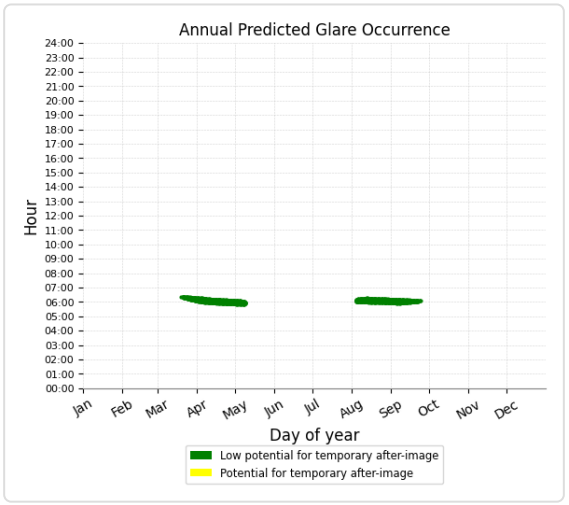


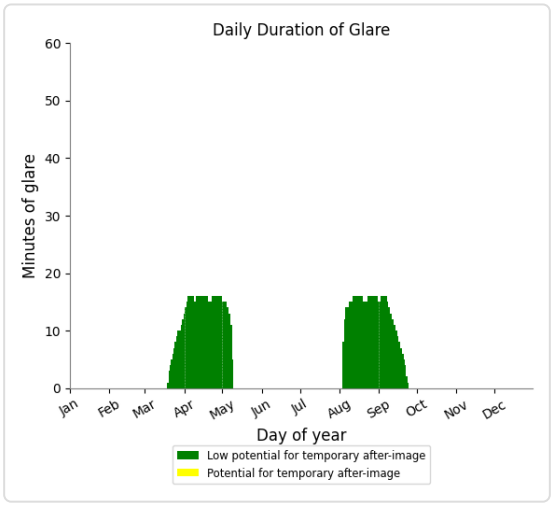


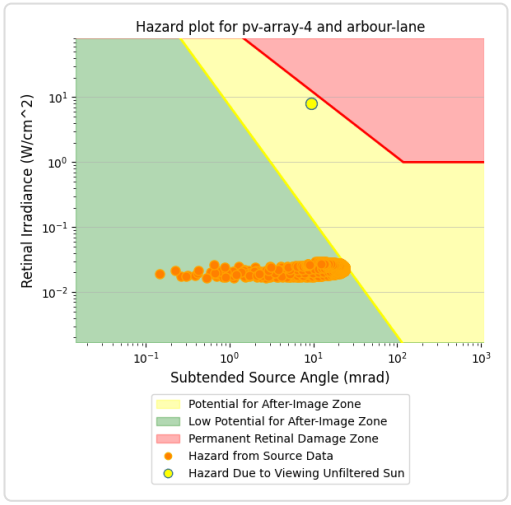
PV array 4 and Route: Arbour lane

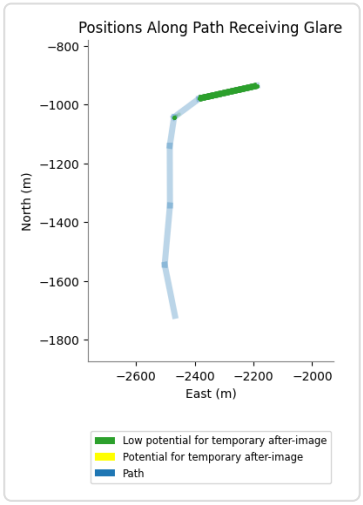
Yellow glare: none

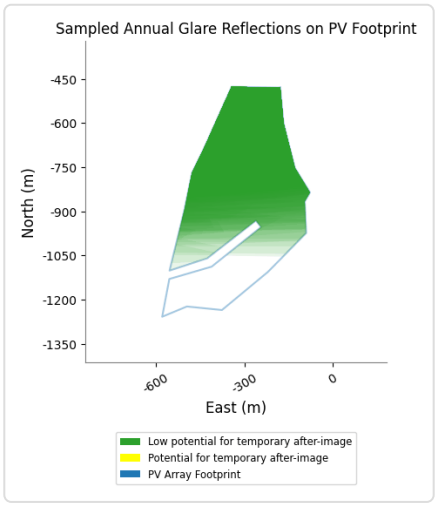
Green glare: 1,362 min.











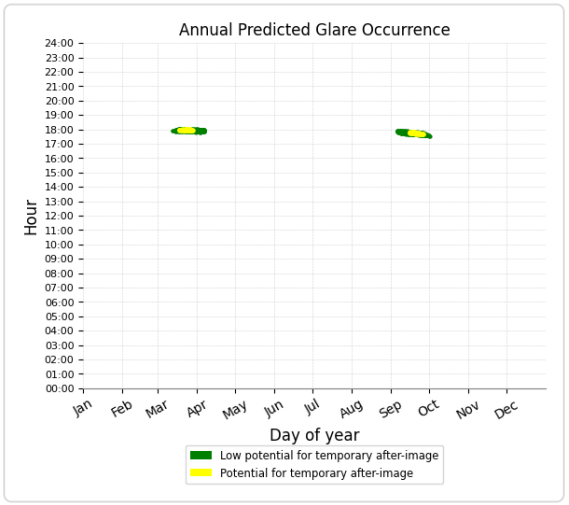
PV array 4 and Route: B6093

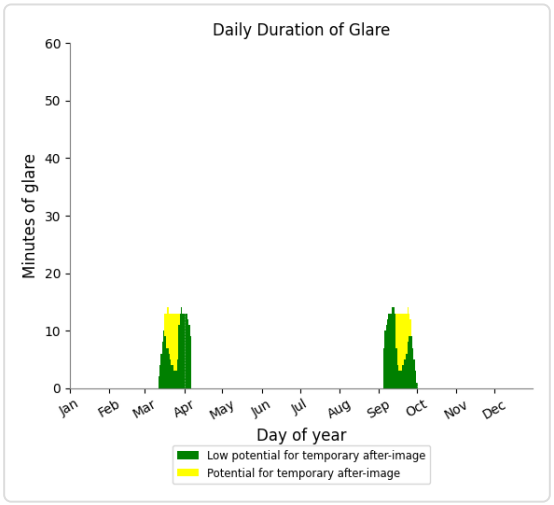
No glare found

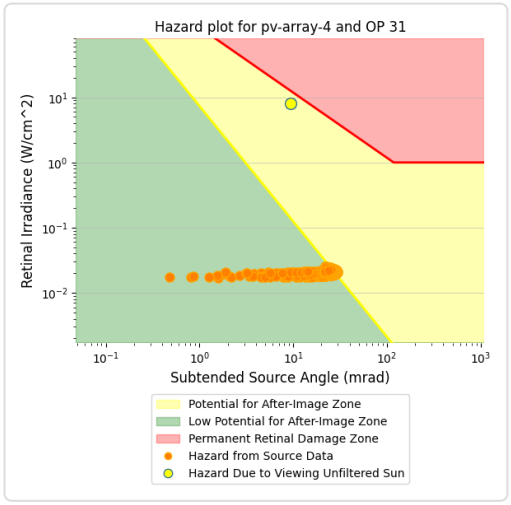
PV array 4 and OP 31

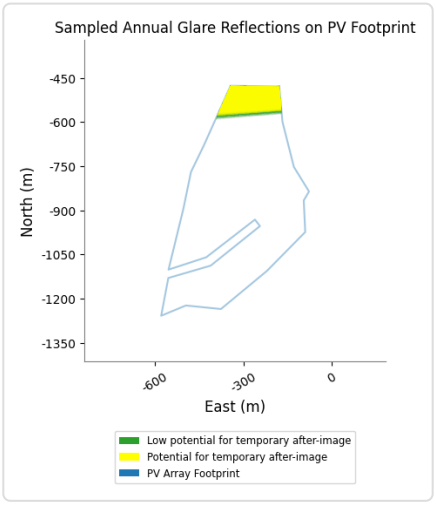
Yellow glare: 180 min.

Green glare: 419 min.





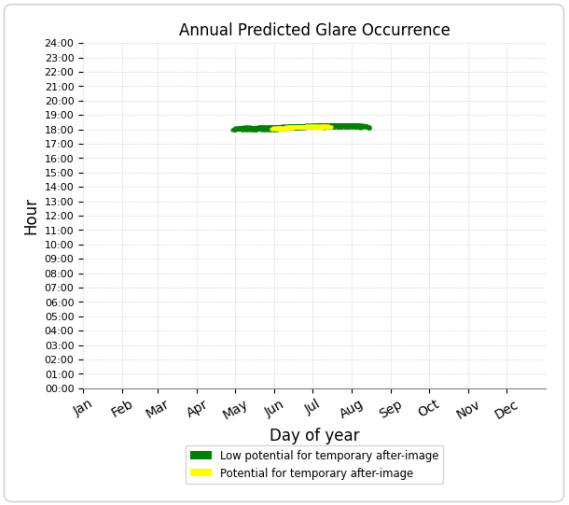


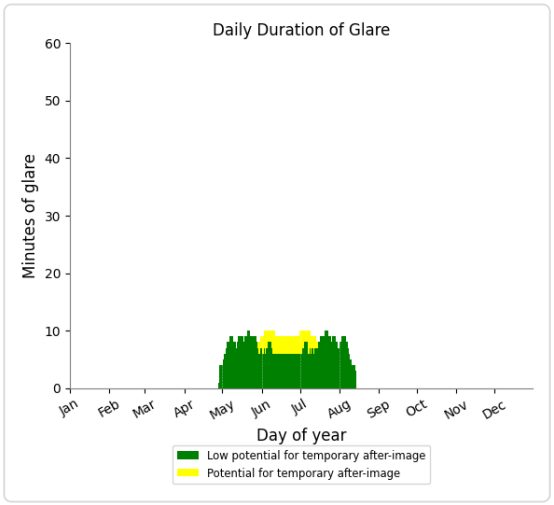


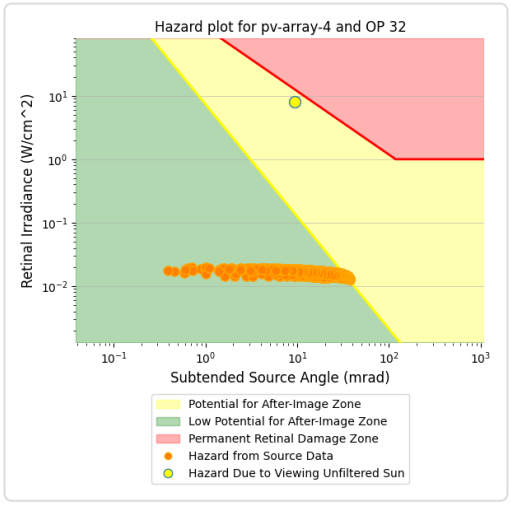
PV array 4 and OP 32

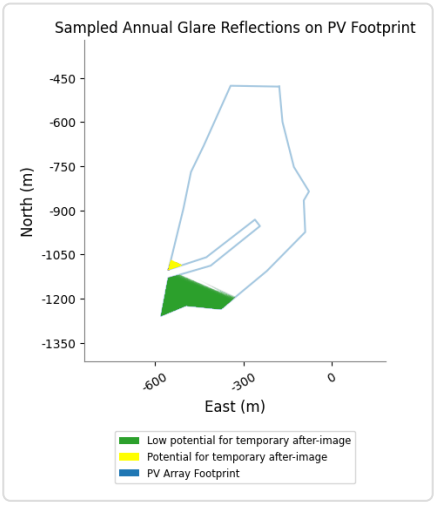
Yellow glare: 133 min.

Green glare: 787 min.





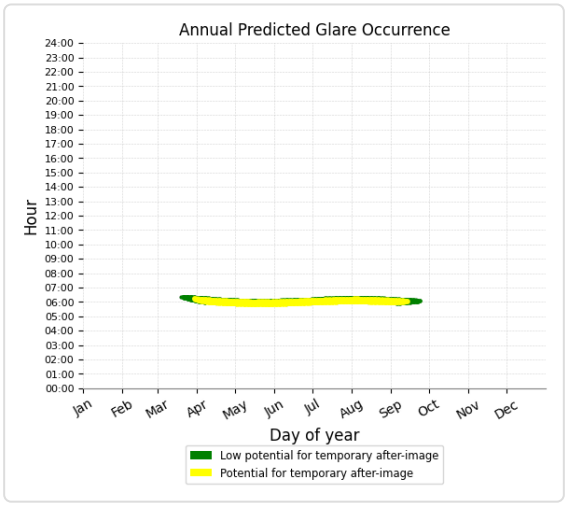


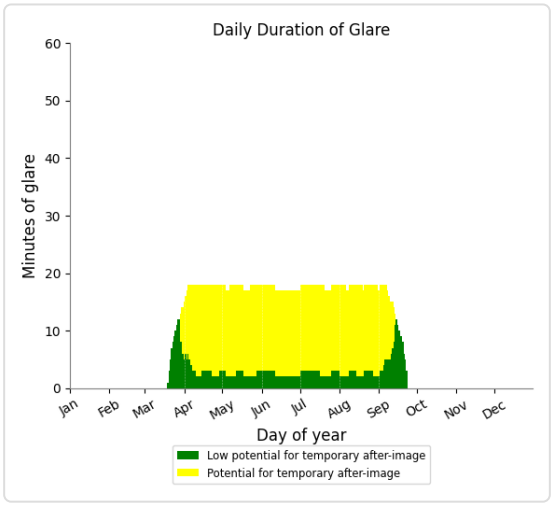


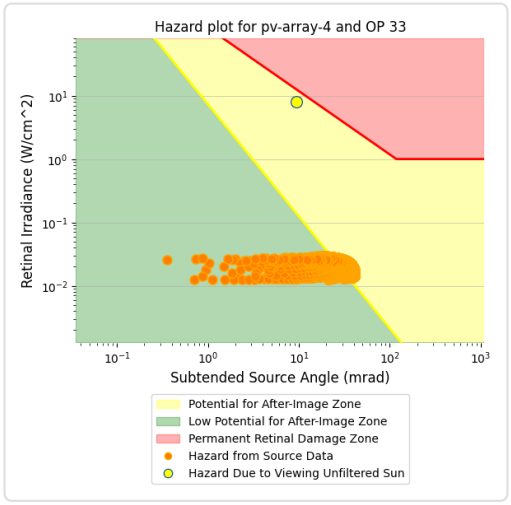
PV array 4 and OP 33

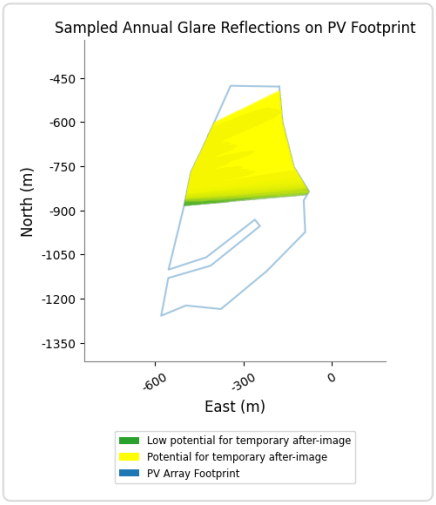
Yellow glare: 2,490 min.

Green glare: 644 min.





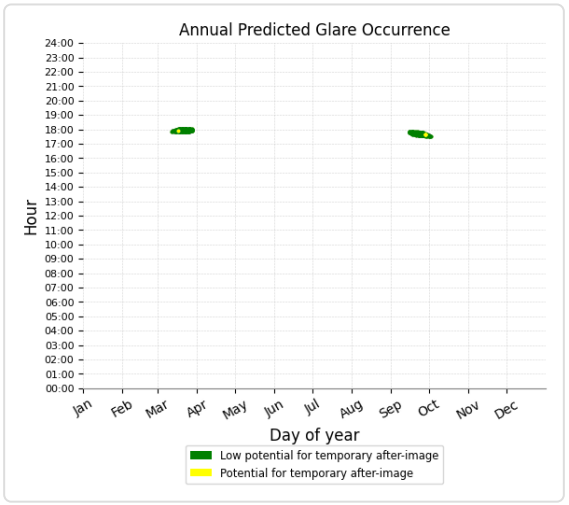


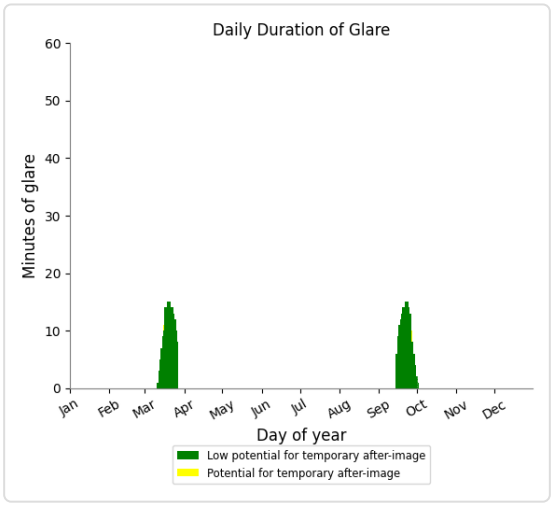


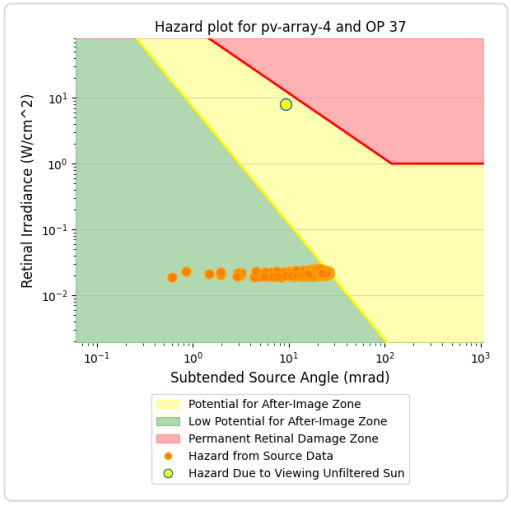
PV array 4 and OP 37

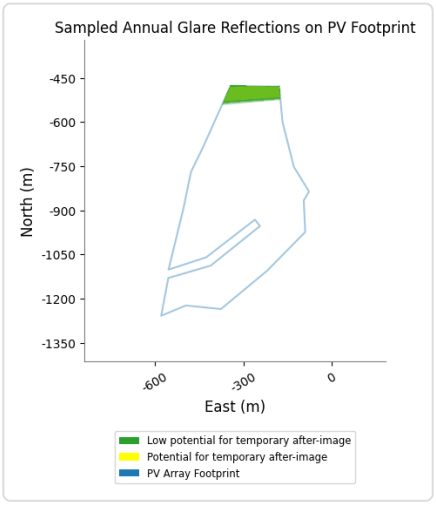
Yellow glare: 3 min.

Green glare: 359 min.





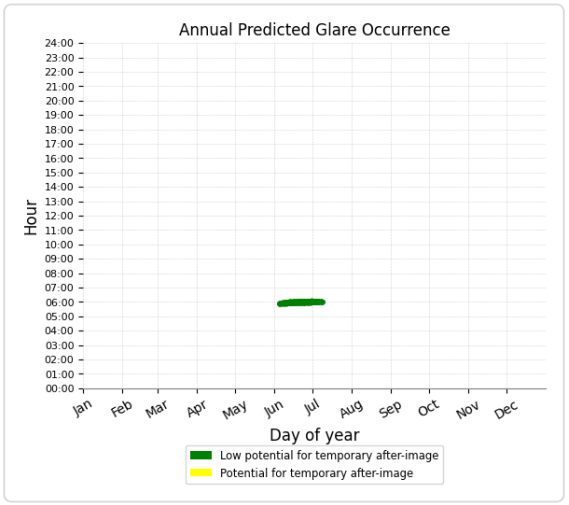


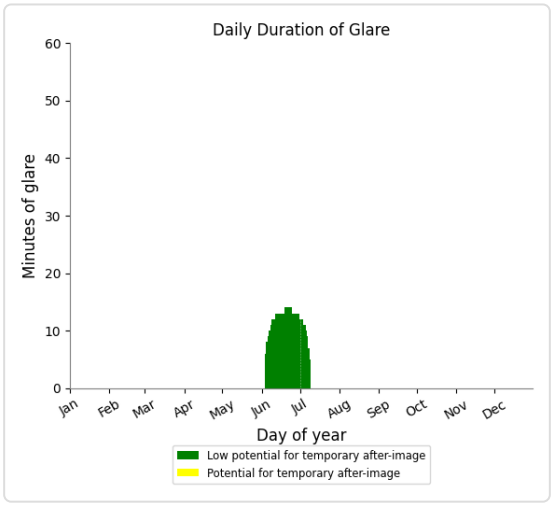


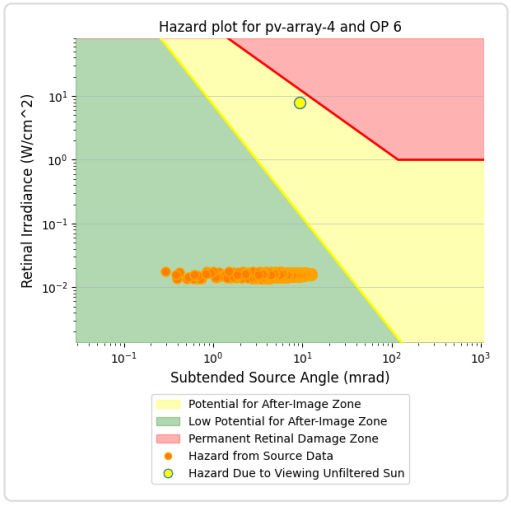
PV array 4 and OP 6

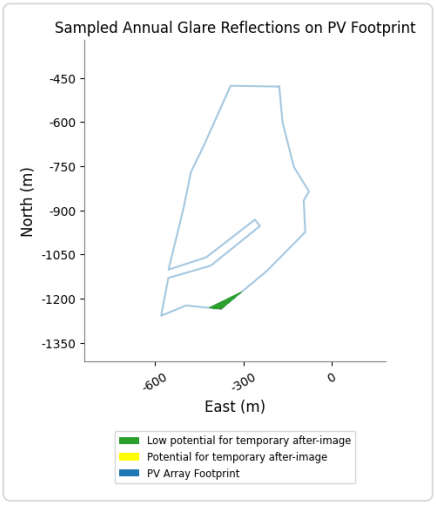
Yellow glare: none

Green glare: 422 min.





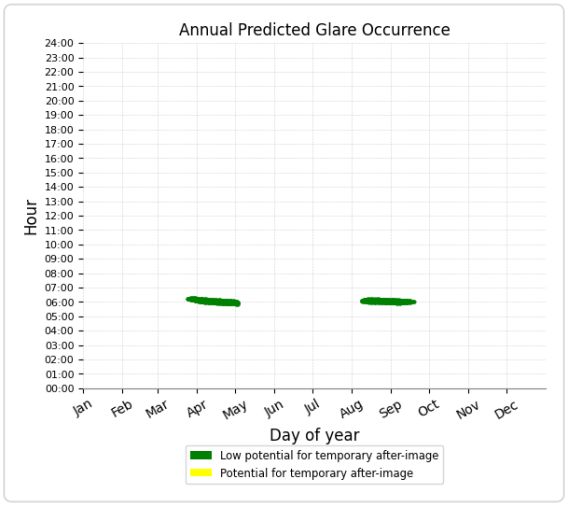


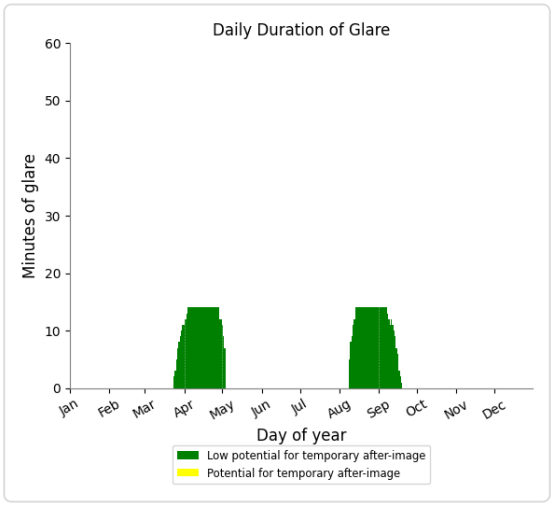


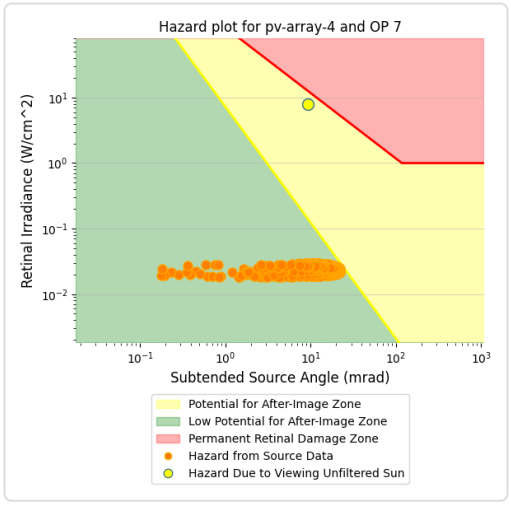
PV array 4 and OP 7

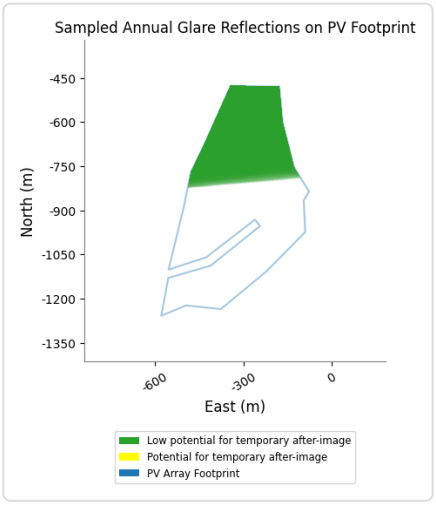
Yellow glare: none

Green glare: 984 min.





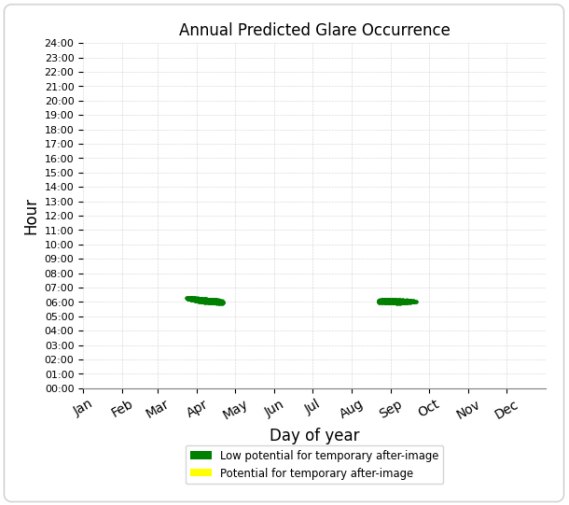


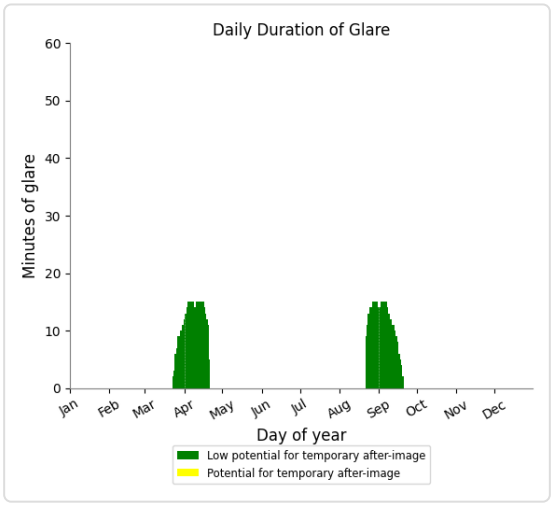


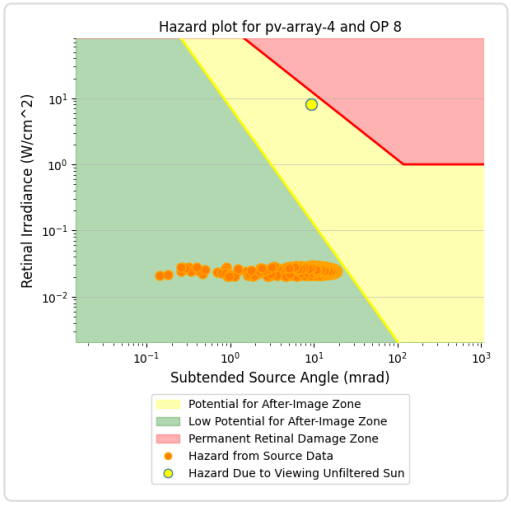
PV array 4 and OP 8

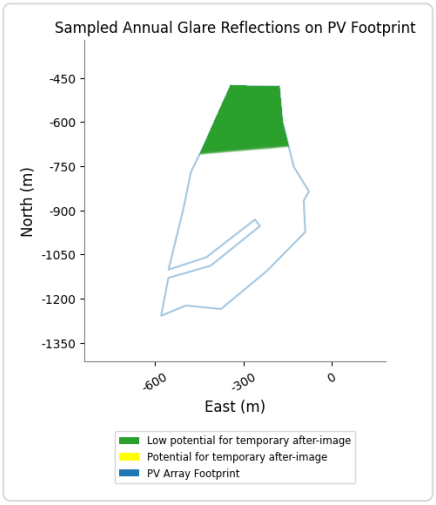
Yellow glare: none

Green glare: 710 min.





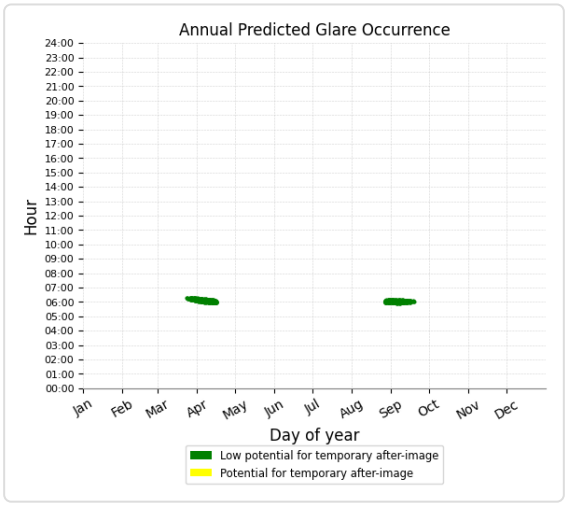


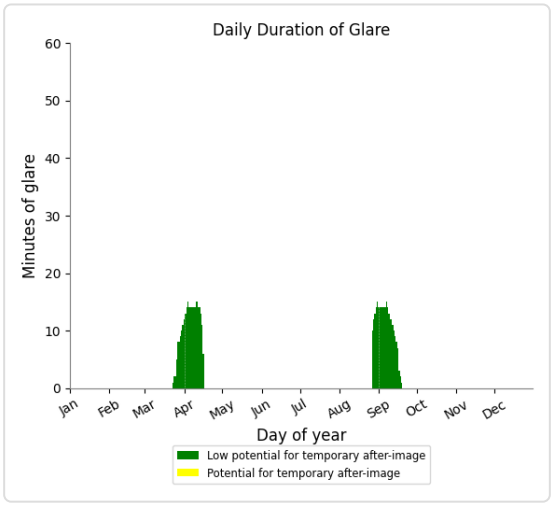


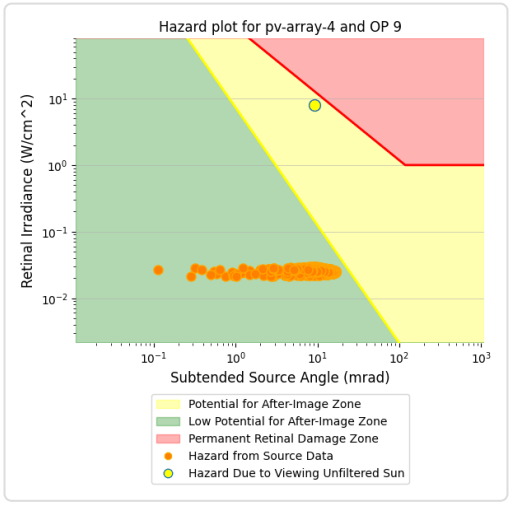
PV array 4 and OP 9

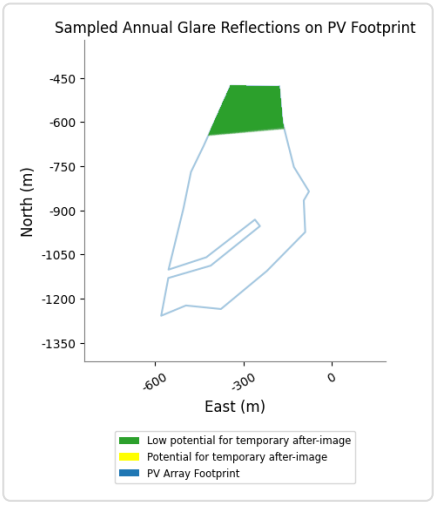
Yellow glare: none

Green glare: 532 min.





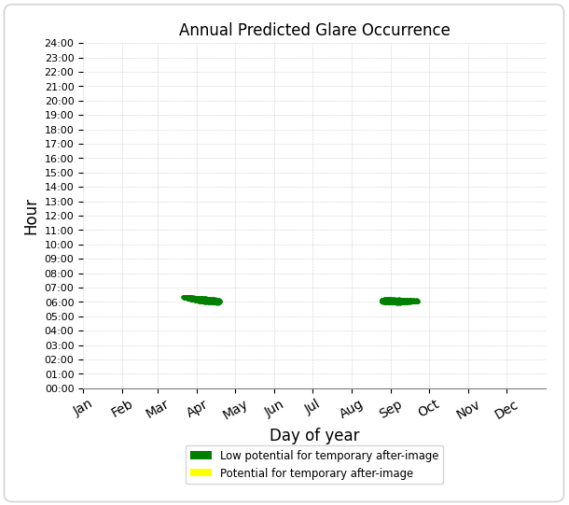


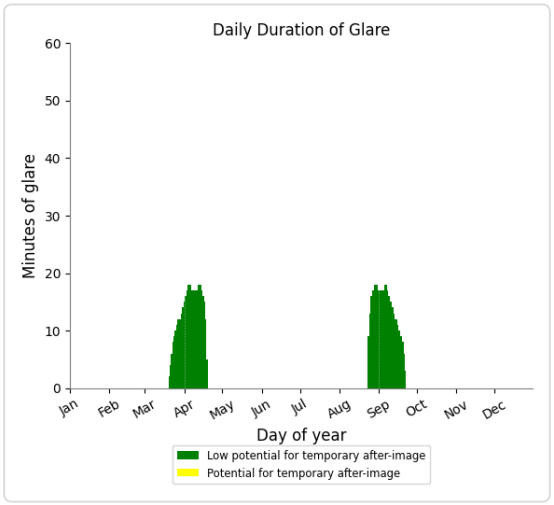


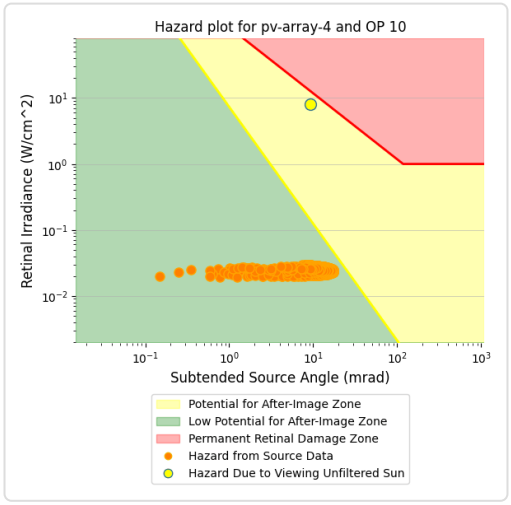
PV array 4 and OP 10

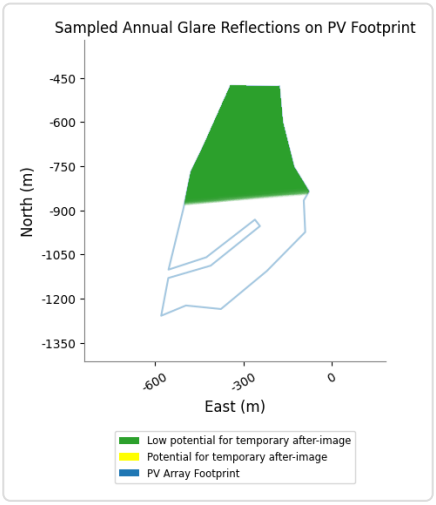
Yellow glare: none

Green glare: 836 min.









PV array 4 and OP 1

No glare found

PV array 4 and OP 2

No glare found

PV array 4 and OP 3

No glare found

PV array 4 and OP 4

No glare found

PV array 4 and OP 5

No glare found

PV array 4 and OP 11

No glare found

PV array 4 and OP 12

No glare found

PV array 4 and OP 13

No glare found

PV array 4 and OP 14

No glare found

PV array 4 and OP 15

No glare found

PV array 4 and OP 16

No glare found

PV array 4 and OP 17

No glare found

PV array 4 and OP 18

No glare found

PV array 4 and OP 19

No glare found

PV array 4 and OP 20

No glare found

PV array 4 and OP 21

No glare found

PV array 4 and OP 22

No glare found

PV array 4 and OP 23

No glare found

PV array 4 and OP 24

No glare found

PV array 4 and OP 25

No glare found

PV array 4 and OP 26

No glare found

PV array 4 and OP 27

No glare found

PV array 4 and OP 28

No glare found

PV array 4 and OP 29

No glare found

PV array 4 and OP 30

No glare found

PV array 4 and OP 34

No glare found

PV array 4 and OP 35

No glare found

PV array 4 and OP 36

No glare found

PV array 4 and OP 38

No glare found

PV: PV array 5 potential temporary after-image

Receptor results ordered by category of glare

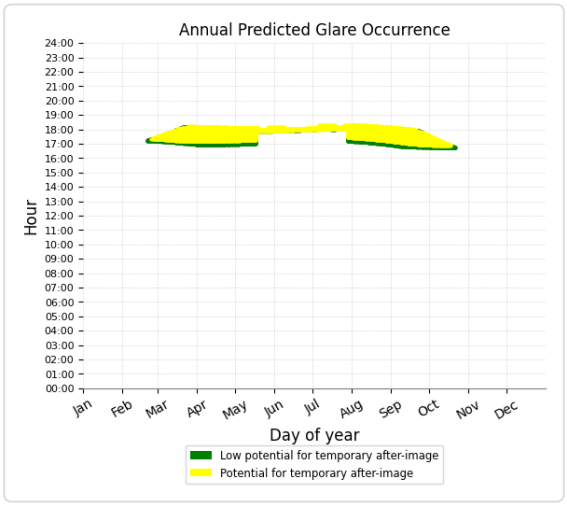
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
B6094 and Ruddle Lane	2,391	39.9	8,472	141.2
M18	1,329	22.1	7,842	130.7
Arbour lane	244	4.1	0	0.0
B6093	0	0.0	0	0.0
OP 6	868	14.5	966	16.1
OP 7	142	2.4	0	0.0
OP 10	80	1.3	0	0.0
OP 33	257	4.3	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0

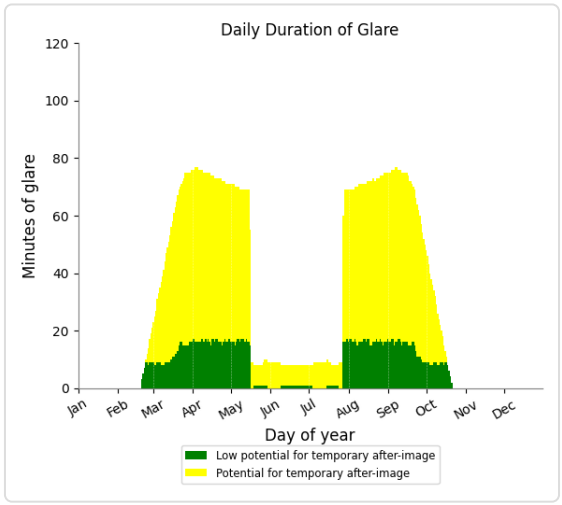
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0

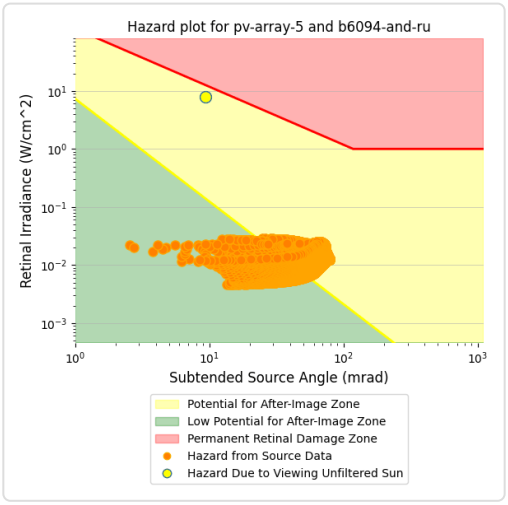
PV array 5 and Route: B6094 and Ruddle Lane

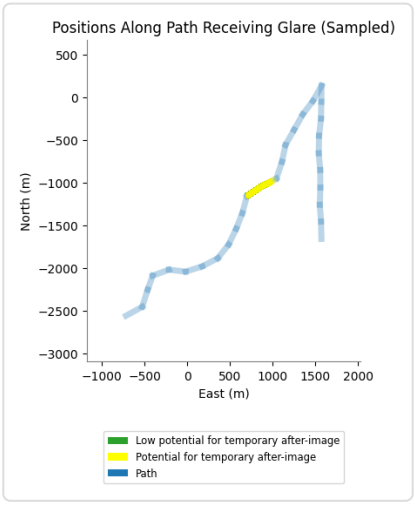
Yellow glare: 8,472 min.

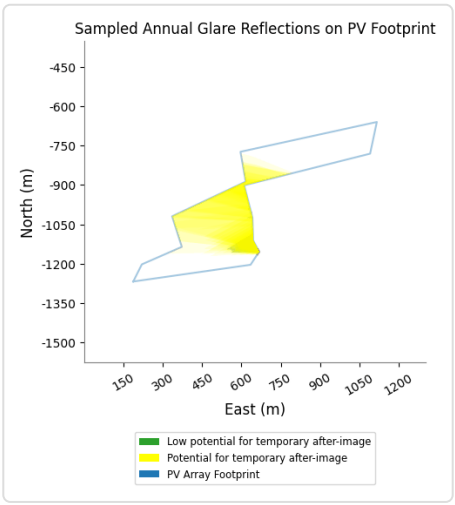
Green glare: 2,391 min.







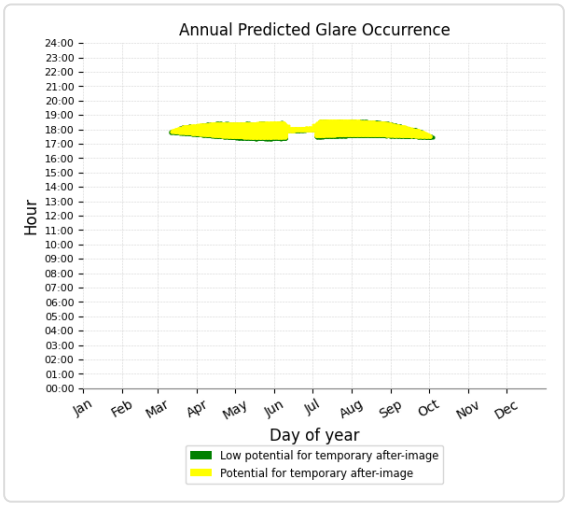


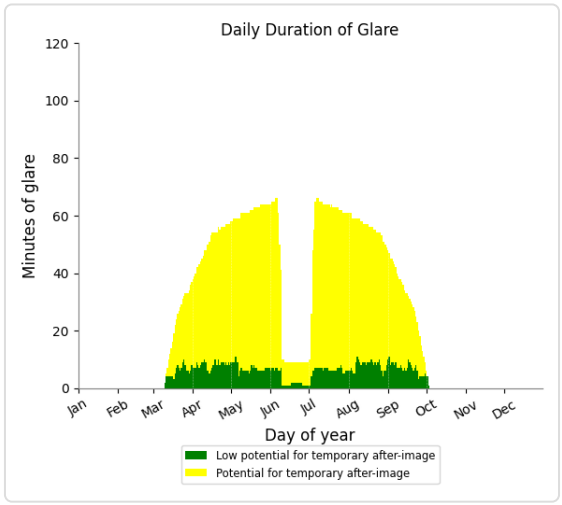


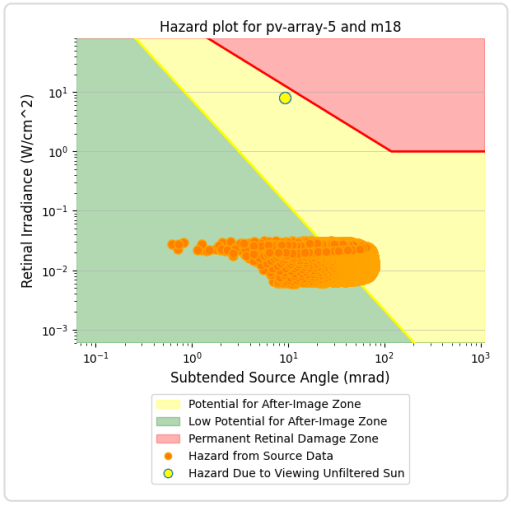
PV array 5 and Route: M18

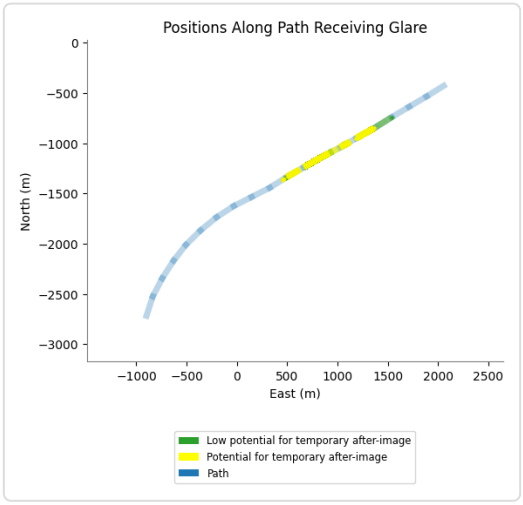
Yellow glare: 7,842 min.

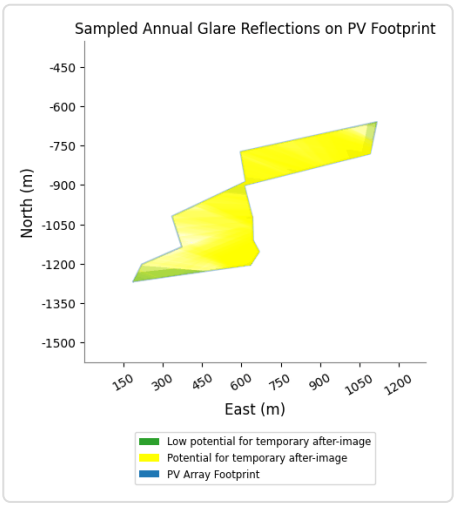
Green glare: 1,329 min.







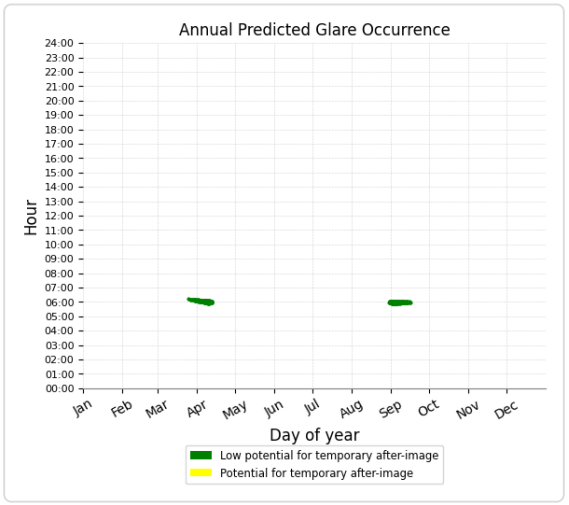


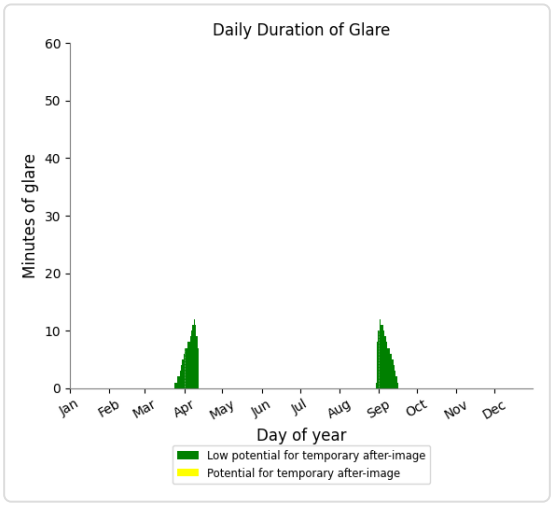


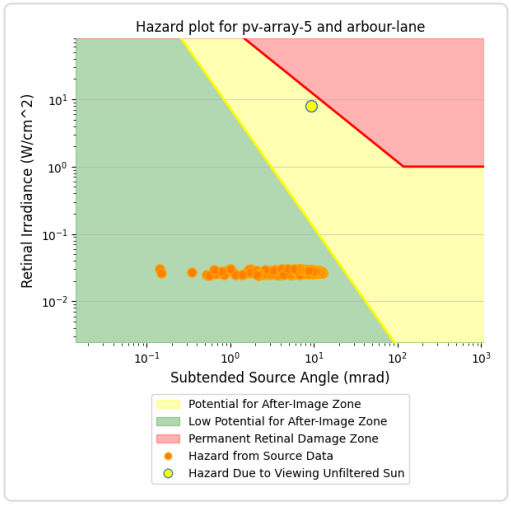
PV array 5 and Route: Arbour lane

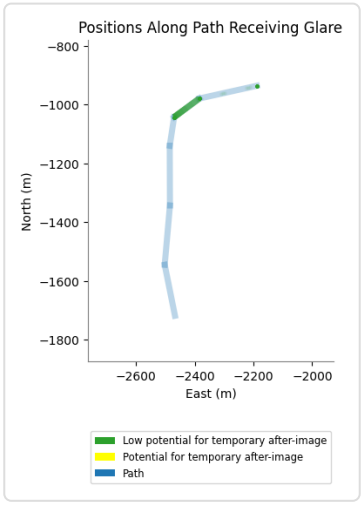
Yellow glare: none

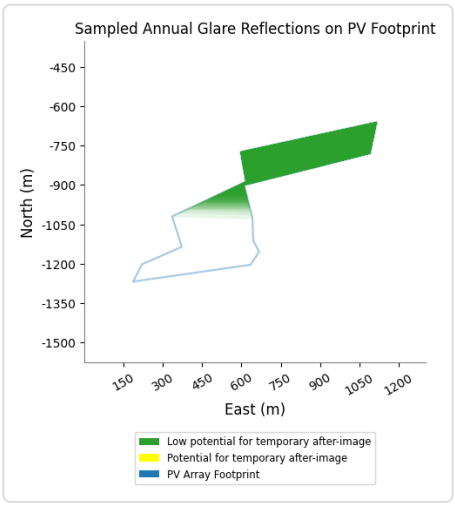
Green glare: 244 min.











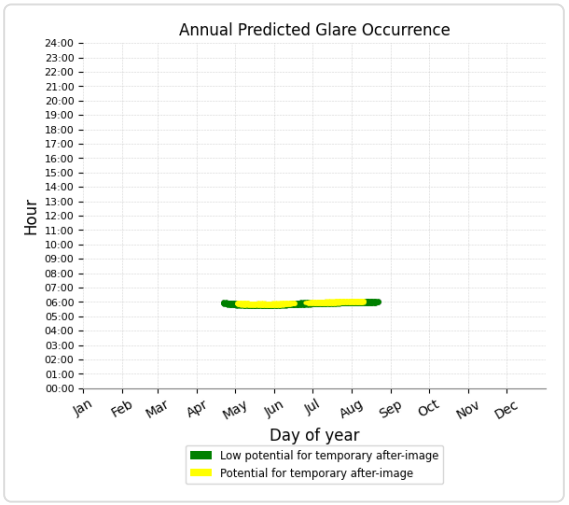
PV array 5 and Route: B6093

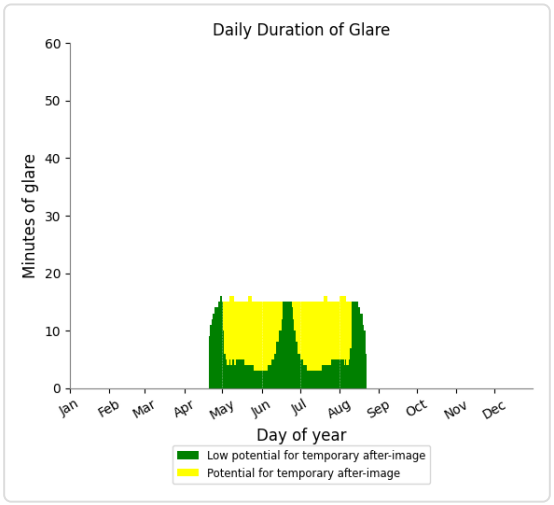
No glare found

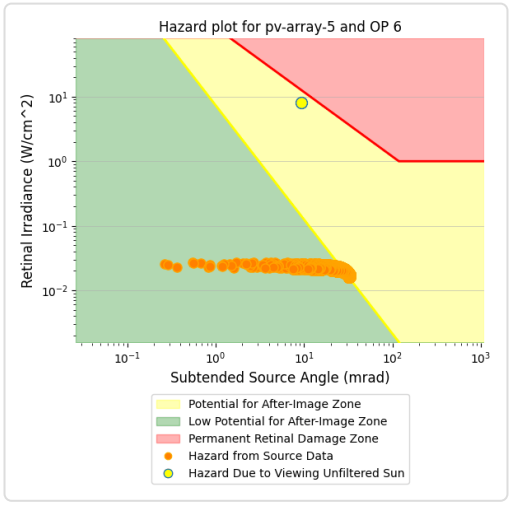
PV array 5 and OP 6

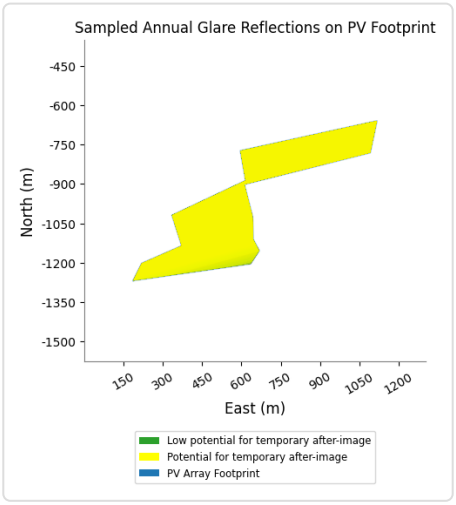
Yellow glare: 966 min.

Green glare: 868 min.





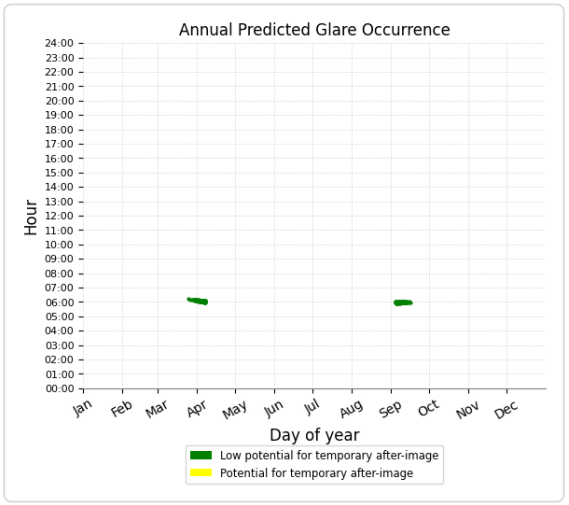


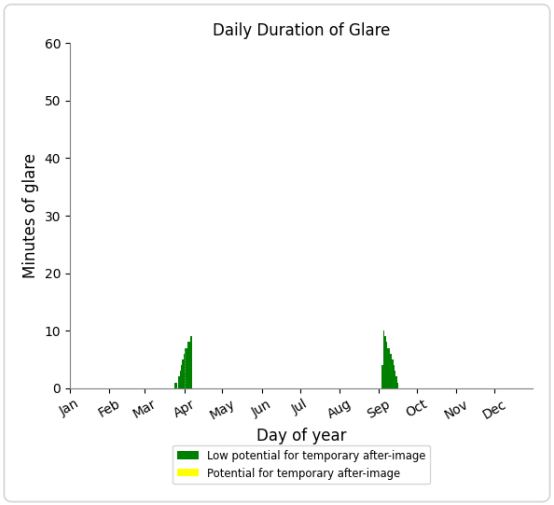


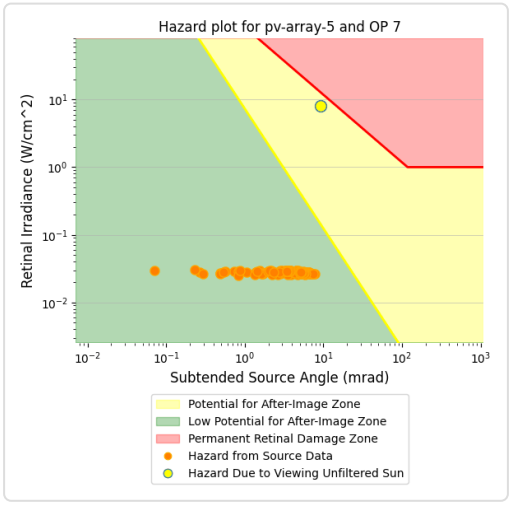
PV array 5 and OP 7

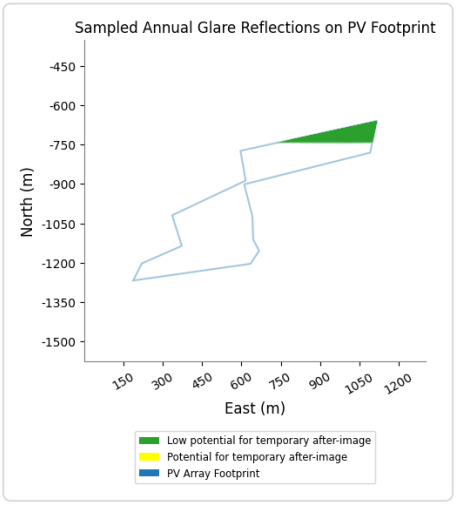
Yellow glare: none

Green glare: 142 min.





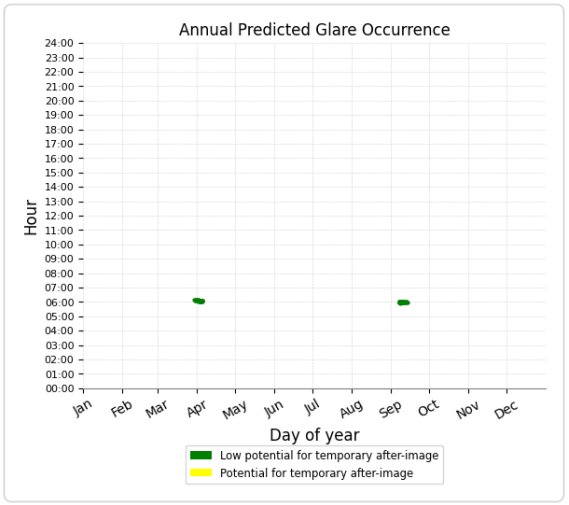


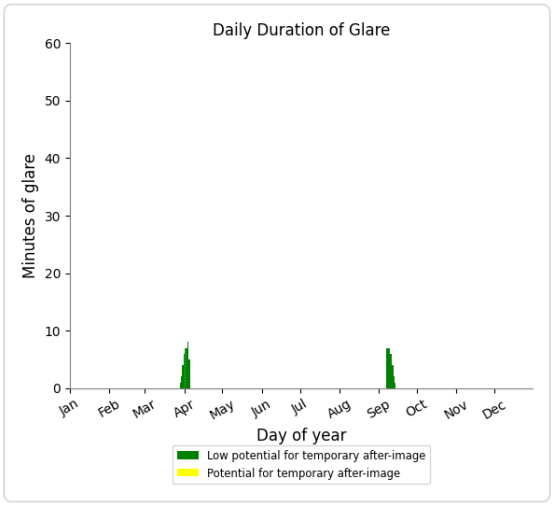


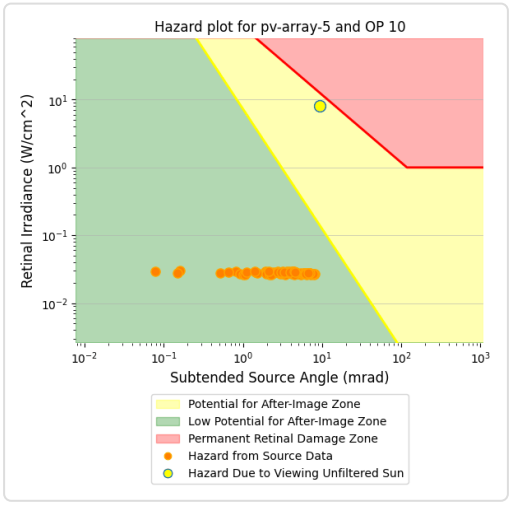
PV array 5 and OP 10

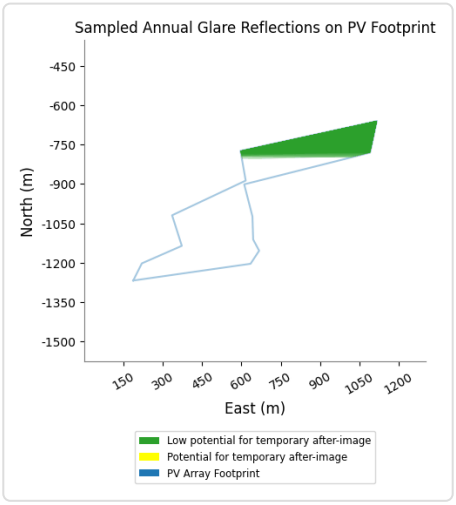
Yellow glare: none

Green glare: 80 min.



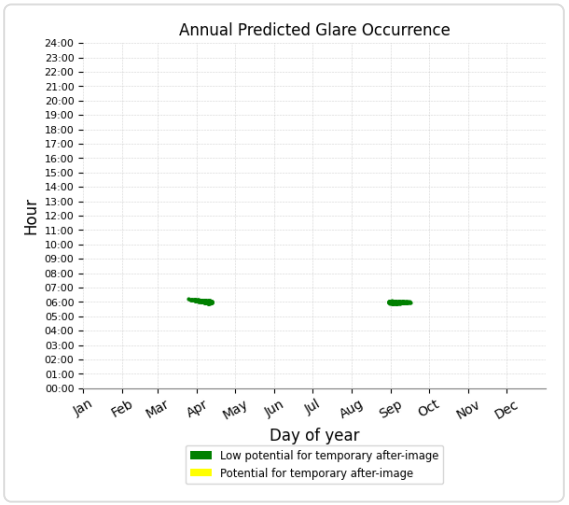


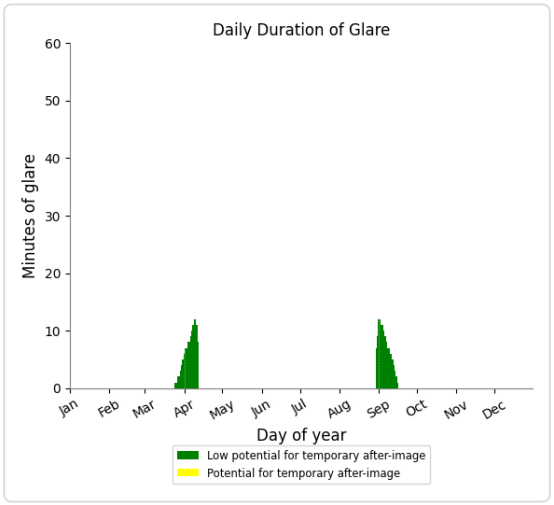


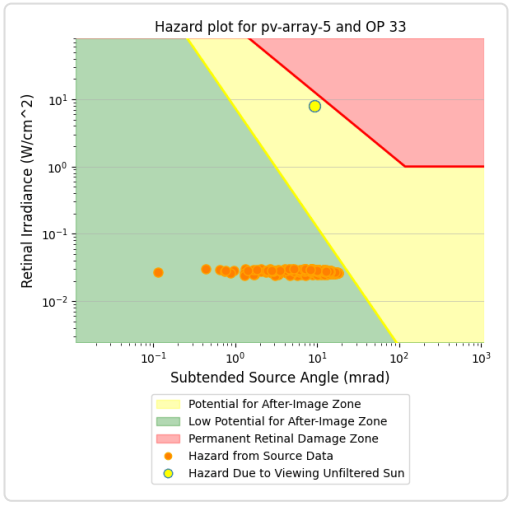


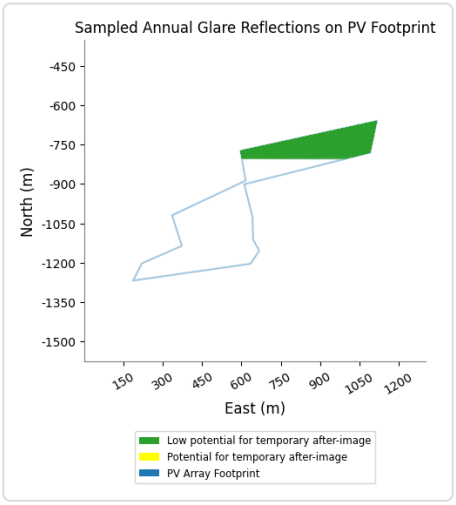
PV array 5 and OP 33

Yellow glare: none
Green glare: 257 min.









PV array 5 and OP 1

No glare found

PV array 5 and OP 2

No glare found

PV array 5 and OP 3

No glare found

PV array 5 and OP 4

No glare found

PV array 5 and OP 5

No glare found

PV array 5 and OP 8

No glare found

PV array 5 and OP 9

No glare found

PV array 5 and OP 11

No glare found

PV array 5 and OP 12

No glare found

PV array 5 and OP 13

No glare found

PV array 5 and OP 14

No glare found

PV array 5 and OP 15

No glare found

PV array 5 and OP 16

No glare found

PV array 5 and OP 17

No glare found

PV array 5 and OP 18

No glare found

PV array 5 and OP 19

No glare found

PV array 5 and OP 20

No glare found

PV array 5 and OP 21

No glare found

PV array 5 and OP 22

No glare found

PV array 5 and OP 23

No glare found

PV array 5 and OP 24

No glare found

PV array 5 and OP 25

No glare found

PV array 5 and OP 26

No glare found

PV array 5 and OP 27

No glare found

PV array 5 and OP 28

No glare found

PV array 5 and OP 29

No glare found

PV array 5 and OP 30

No glare found

PV array 5 and OP 31

No glare found

PV array 5 and OP 32

No glare found

PV array 5 and OP 34

No glare found

PV array 5 and OP 35

No glare found

PV array 5 and OP 36

No glare found

PV array 5 and OP 37

No glare found

PV array 5 and OP 38

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 1**
Site configuration: **JS W1 PRoWs**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 500 kW to 1 MW
Site ID 153738.25566

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	11,423	190.4	27,497	458.3	-
PV array 2	8.0	180.0	322,218	5,370.3	359,284	5,988.1	-
PV array 3	8.0	180.0	10,373	172.9	10,493	174.9	-
PV array 4	8.0	180.0	7,022	117.0	11,166	186.1	-
PV array 5	8.0	180.0	11,422	190.4	21,562	359.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

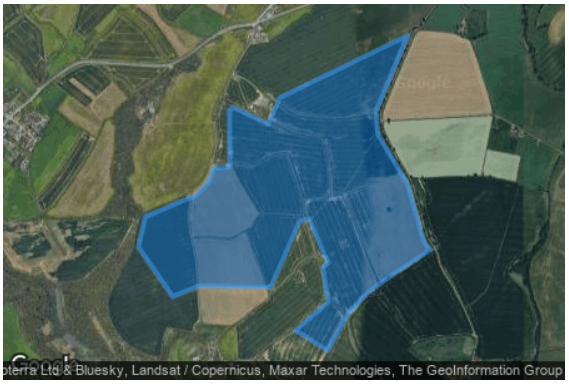
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	111,880	1,864.7	116,228	1,937.1
PRoW 12	2,016	33.6	4,459	74.3
PRoW 11	1,550	25.8	4,087	68.1
PRoW 13	4,702	78.4	2,583	43.0
PRoW 14	5,925	98.8	8,321	138.7
PRoW 2	98,555	1,642.6	109,331	1,822.2
PRoW 3	6,694	111.6	18,101	301.7
PRoW 4	2,346	39.1	4,603	76.7
PRoW 5	271	4.5	239	4.0
PRoW 6	1,851	30.9	3,203	53.4
PRoW 7	3,882	64.7	4,338	72.3
PRoW 8	11,990	199.8	38,947	649.1

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 9	7,851	130.8	12,585	209.8
Route 10	100,889	1,681.5	96,747	1,612.5
Route 15	2,056	34.3	6,230	103.8

Component Data

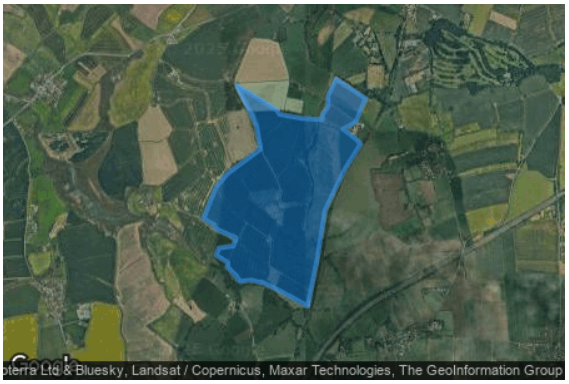
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.462880	-1.242763	80.60	3.80	84.40
2	53.461615	-1.245982	76.30	3.80	80.10
3	53.461117	-1.247097	70.70	3.80	74.50
4	53.460248	-1.248428	70.10	3.80	73.90
5	53.458766	-1.249812	78.70	3.80	82.50
6	53.459596	-1.252011	72.20	3.80	76.00
7	53.460759	-1.249780	66.60	3.80	70.40
8	53.462151	-1.250155	67.40	3.80	71.20
9	53.462362	-1.249769	66.30	3.80	70.10
10	53.462650	-1.250026	65.00	3.80	68.80
11	53.464150	-1.251099	66.70	3.80	70.50
12	53.464047	-1.251754	66.20	3.80	70.00
13	53.461346	-1.253738	60.60	3.80	64.40
14	53.461416	-1.258599	63.50	3.80	67.30
15	53.460975	-1.260476	67.20	3.80	71.00
16	53.462983	-1.262831	82.20	3.80	86.00
17	53.464219	-1.262370	83.30	3.80	87.10
18	53.464950	-1.259516	81.10	3.80	84.90
19	53.465077	-1.258915	80.50	3.80	84.30
20	53.465639	-1.257976	79.10	3.80	82.90
21	53.466204	-1.257649	78.40	3.80	82.20
22	53.466262	-1.256555	76.60	3.80	80.40
23	53.468550	-1.256575	78.50	3.80	82.30
24	53.468697	-1.256344	78.50	3.80	82.30
25	53.468007	-1.253919	78.10	3.80	81.90
26	53.469079	-1.253110	78.90	3.80	82.70
27	53.471629	-1.244293	77.00	3.80	80.80
28	53.468512	-1.246508	83.60	3.80	87.40
29	53.467605	-1.246379	82.70	3.80	86.50
30	53.465556	-1.244326	78.30	3.80	82.10
31	53.463205	-1.243211	79.60	3.80	83.40

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451858	-1.242251	76.10	3.80	79.90
2	53.452101	-1.243817	77.00	3.80	80.80
3	53.451968	-1.245330	76.40	3.80	80.20
4	53.452365	-1.245780	77.10	3.80	80.90
5	53.453157	-1.247089	73.80	3.80	77.60
6	53.453508	-1.247014	77.60	3.80	81.40
7	53.454133	-1.248632	80.80	3.80	84.60
8	53.454727	-1.248246	84.60	3.80	88.40
9	53.454880	-1.246271	89.30	3.80	93.10
10	53.455544	-1.245960	90.30	3.80	94.10
11	53.456142	-1.248170	86.90	3.80	90.70
12	53.456356	-1.248750	84.00	3.80	87.80
13	53.456595	-1.248900	83.60	3.80	87.40
14	53.457132	-1.250386	76.70	3.80	80.50
15	53.459695	-1.248626	72.60	3.80	76.40
16	53.460821	-1.247009	71.40	3.80	75.20
17	53.462776	-1.242546	80.50	3.80	84.30
18	53.464717	-1.243104	76.10	3.80	79.90
19	53.465886	-1.244037	77.30	3.80	81.10
20	53.467981	-1.245797	82.50	3.80	86.30
21	53.465982	-1.240304	65.80	3.80	69.60
22	53.465631	-1.239928	65.40	3.80	69.20
23	53.465299	-1.236903	62.50	3.80	66.30
24	53.465190	-1.234070	62.90	3.80	66.70
25	53.465573	-1.234006	62.10	3.80	65.90
26	53.466250	-1.233276	60.40	3.80	64.20
27	53.467151	-1.233244	57.90	3.80	61.70
28	53.468498	-1.232139	55.90	3.80	59.70
29	53.466900	-1.228049	68.80	3.80	72.60
30	53.464957	-1.229472	73.50	3.80	77.30
31	53.464421	-1.231172	72.30	3.80	76.10
32	53.464012	-1.230260	76.50	3.80	80.30
33	53.463498	-1.229219	81.20	3.80	85.00
34	53.463171	-1.228764	83.80	3.80	87.60
35	53.461159	-1.230909	82.30	3.80	86.10
36	53.457824	-1.233656	80.90	3.80	84.70
37	53.454042	-1.234665	90.90	3.80	94.70
38	53.449966	-1.236038	96.00	3.80	99.80
39	53.451282	-1.240093	81.60	3.80	85.40
40	53.451947	-1.242432	76.70	3.80	80.50

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465402	-1.224873	79.20	3.80	83.00
2	53.464182	-1.223639	86.50	3.80	90.30
3	53.463831	-1.223800	88.00	3.80	91.80
4	53.463365	-1.223832	90.80	3.80	94.60
5	53.462553	-1.223071	99.60	3.80	103.40
6	53.462336	-1.225077	95.10	3.80	98.90
7	53.461883	-1.225410	97.70	3.80	101.50
8	53.463959	-1.226901	83.10	3.80	86.90
9	53.465198	-1.225764	78.40	3.80	82.20

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461091	-1.227555	95.90	3.80	99.70
2	53.461116	-1.230044	85.70	3.80	89.50
3	53.459289	-1.231418	86.80	3.80	90.60
4	53.458484	-1.232072	86.60	3.80	90.40
5	53.457366	-1.232458	86.30	3.80	90.10
6	53.455504	-1.233220	87.80	3.80	91.60
7	53.455881	-1.231289	90.00	3.80	93.80
8	53.457031	-1.228800	97.30	3.80	101.10
9	53.456833	-1.228542	98.40	3.80	102.20
10	53.455625	-1.231064	90.90	3.80	94.70
11	53.455248	-1.233231	88.10	3.80	91.90
12	53.454096	-1.233596	89.80	3.80	93.60
13	53.454409	-1.232330	90.00	3.80	93.80
14	53.454301	-1.230538	93.40	3.80	97.20
15	53.455464	-1.228188	98.40	3.80	102.20
16	53.456651	-1.226227	103.50	3.80	107.30
17	53.457615	-1.226302	104.50	3.80	108.30
18	53.457890	-1.226034	105.80	3.80	109.60
19	53.458637	-1.226806	103.70	3.80	107.50
20	53.459987	-1.227433	98.50	3.80	102.30

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454007	-1.222055	116.70	3.80	120.50
2	53.454582	-1.215318	126.90	3.80	130.70
3	53.455030	-1.214824	128.20	3.80	132.00
4	53.455413	-1.215167	129.90	3.80	133.70
5	53.456205	-1.215210	132.10	3.80	135.90
6	53.457304	-1.215682	132.20	3.80	136.00
7	53.458390	-1.208451	120.40	3.80	124.20
8	53.459476	-1.208065	122.00	3.80	125.80
9	53.458454	-1.215897	130.70	3.80	134.50
10	53.457432	-1.215597	131.70	3.80	135.50
11	53.456243	-1.219824	133.90	3.80	137.70
12	53.455196	-1.219266	129.10	3.80	132.90
13	53.454595	-1.221562	118.00	3.80	121.80

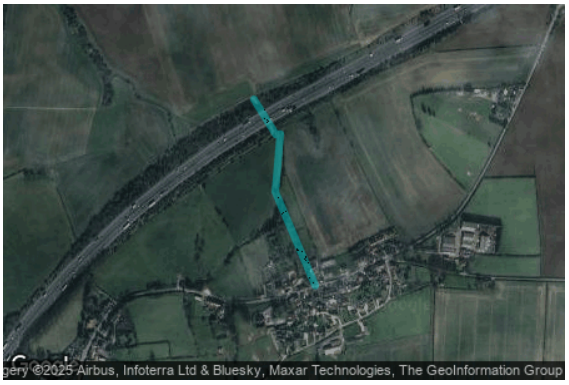
Route Receptors

Name: PRoW 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.467583	-1.235933	60.20	2.50	62.70
2	53.461835	-1.237564	74.40	2.50	76.90
3	53.460929	-1.240791	82.40	2.50	84.90

Name: PRoW 12
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451170	-1.225774	107.79	2.50	110.29
2	53.450453	-1.225020	110.88	2.50	113.38
3	53.450463	-1.224864	111.02	2.50	113.52
4	53.449281	-1.225038	113.36	2.50	115.86
5	53.447374	-1.223666	132.68	2.50	135.18

Name: PRoW 11
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451113	-1.223105	112.70	2.50	115.20
2	53.449666	-1.221973	116.50	2.50	119.00
3	53.448190	-1.220546	129.70	2.50	132.20

Name: PRoW 13
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454275	-1.262334	74.40	2.50	76.90
2	53.454000	-1.264479	75.50	2.50	78.00
3	53.453566	-1.267977	83.10	2.50	85.60

Name: PRoW 14
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.463046	-1.217388	117.90	2.50	120.40
2	53.463269	-1.215983	121.10	2.50	123.60
3	53.463697	-1.215919	119.10	2.50	121.60
4	53.464400	-1.210200	124.30	2.50	126.80
5	53.464681	-1.210050	124.20	2.50	126.70
6	53.464892	-1.209707	123.90	2.50	126.40
7	53.465013	-1.209728	123.70	2.50	126.20

Name: PRoW 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.471571	-1.243976	76.60	2.50	79.10
2	53.469652	-1.245312	81.60	2.50	84.10
3	53.468436	-1.246151	84.10	2.50	86.60
4	53.467584	-1.245941	83.00	2.50	85.50
5	53.465575	-1.244032	80.20	2.50	82.70
6	53.463573	-1.243034	81.00	2.50	83.50
7	53.459213	-1.239510	83.20	2.50	85.70
8	53.455892	-1.240692	92.90	2.50	95.40
9	53.454013	-1.241175	97.60	2.50	100.10
10	53.452638	-1.241315	90.10	2.50	92.60
11	53.451750	-1.241958	76.80	2.50	79.30
12	53.451569	-1.242142	73.80	2.50	76.30
13	53.451358	-1.241702	77.10	2.50	79.60
14	53.450115	-1.242099	85.50	2.50	88.00
15	53.449831	-1.242121	88.00	2.50	90.50
16	53.448431	-1.242856	98.20	2.50	100.70
17	53.448147	-1.243655	99.80	2.50	102.30
18	53.447377	-1.243376	101.70	2.50	104.20
19	53.446294	-1.243306	105.90	2.50	108.40
20	53.445524	-1.242754	108.20	2.50	110.70
21	53.444699	-1.243269	112.10	2.50	114.60
22	53.444255	-1.243312	113.50	2.50	116.00
23	53.443284	-1.242647	114.70	2.50	117.20
24	53.441763	-1.241445	113.20	2.50	115.70

Name: PRoW 3
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.467597	-1.246139	82.80	2.50	85.30
2	53.465112	-1.248810	74.70	2.50	77.20
3	53.464895	-1.249658	72.00	2.50	74.50
4	53.463924	-1.251353	66.40	2.50	68.90
5	53.461152	-1.253617	60.40	2.50	62.90
6	53.460806	-1.253729	61.10	2.50	63.60
7	53.459791	-1.256002	59.70	2.50	62.20
8	53.458970	-1.257477	60.40	2.50	62.90

Name: PRoW 4
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.468966	-1.257198	82.00	2.50	84.50
2	53.468480	-1.257542	81.70	2.50	84.20
3	53.466564	-1.257606	80.60	2.50	83.10
4	53.465159	-1.259108	81.40	2.50	83.90
5	53.464246	-1.259398	77.40	2.50	79.90
6	53.462259	-1.258797	67.30	2.50	69.80
7	53.460032	-1.258579	61.50	2.50	64.00
8	53.459725	-1.259008	60.70	2.50	63.20

Name: PRoW 5
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.463002	-1.263113	83.00	2.50	85.50
2	53.461367	-1.261128	70.70	2.50	73.20
3	53.459719	-1.259047	60.50	2.50	63.00

Name: PRoW 6
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.466913	-1.270140	48.20	2.50	50.70
2	53.466392	-1.270387	47.10	2.50	49.60
3	53.465421	-1.270269	40.90	2.50	43.40
4	53.464336	-1.269486	43.20	2.50	45.70
5	53.464128	-1.269113	43.30	2.50	45.80
6	53.464188	-1.265631	57.40	2.50	59.90
7	53.464325	-1.262796	81.80	2.50	84.30

Name: PRoW 7
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451573	-1.242169	73.50	2.50	76.00
2	53.450110	-1.245538	80.20	2.50	82.70
3	53.449113	-1.244357	91.90	2.50	94.40
4	53.448168	-1.243649	99.70	2.50	102.20

Name: PRoW 8
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461851	-1.219755	122.70	2.50	125.20
2	53.460986	-1.222920	119.50	2.50	122.00
3	53.459839	-1.222427	126.40	2.50	128.90
4	53.458695	-1.221842	131.50	2.50	134.00
5	53.457941	-1.221536	135.00	2.50	137.50
6	53.456538	-1.220180	136.00	2.50	138.50
7	53.454456	-1.221927	116.60	2.50	119.10
8	53.453427	-1.222292	116.50	2.50	119.00
9	53.452897	-1.222442	116.10	2.50	118.60
10	53.452169	-1.222051	117.10	2.50	119.60
11	53.451188	-1.225800	107.70	2.50	110.20

Name: PRoW 9
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.464679	-1.228221	77.40	2.50	79.90
2	53.464021	-1.227245	82.10	2.50	84.60
3	53.461557	-1.225388	100.00	2.50	102.50
4	53.461534	-1.221680	121.20	2.50	123.70
5	53.461359	-1.221589	123.70	2.50	126.20

Name: Route 10
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451182	-1.225809	107.70	2.50	110.20
2	53.451559	-1.226002	106.10	2.50	108.60
3	53.450817	-1.228330	101.40	2.50	103.90
4	53.451303	-1.229784	96.80	2.50	99.30
5	53.450952	-1.231205	96.80	2.50	99.30
6	53.450980	-1.235264	98.40	2.50	100.90
7	53.453268	-1.241358	95.70	2.50	98.20
8	53.455344	-1.246079	90.00	2.50	92.50
9	53.456266	-1.249198	79.50	2.50	82.00
10	53.457154	-1.251144	72.40	2.50	74.90
11	53.457726	-1.253461	72.30	2.50	74.80
12	53.458282	-1.254207	72.20	2.50	74.70
13	53.458384	-1.257025	63.00	2.50	65.50

Name: Route 15
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.464643	-1.227971	77.70	2.50	80.20
2	53.465349	-1.226357	76.30	2.50	78.80
3	53.466020	-1.225847	75.60	2.50	78.10
4	53.465873	-1.225230	77.30	2.50	79.80
5	53.466540	-1.223203	81.30	2.50	83.80

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	11,423	190.4	27,497	458.3	-
PV array 2	8.0	180.0	322,218	5,370.3	359,284	5,988.1	-
PV array 3	8.0	180.0	10,373	172.9	10,493	174.9	-
PV array 4	8.0	180.0	7,022	117.0	11,166	186.1	-
PV array 5	8.0	180.0	11,422	190.4	21,562	359.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	111,880	1,864.7	116,228	1,937.1
PRoW 12	2,016	33.6	4,459	74.3
PRoW 11	1,550	25.8	4,087	68.1
PRoW 13	4,702	78.4	2,583	43.0
PRoW 14	5,925	98.8	8,321	138.7
PRoW 2	98,555	1,642.6	109,331	1,822.2
PRoW 3	6,694	111.6	18,101	301.7
PRoW 4	2,346	39.1	4,603	76.7
PRoW 5	271	4.5	239	4.0
PRoW 6	1,851	30.9	3,203	53.4
PRoW 7	3,882	64.7	4,338	72.3
PRoW 8	11,990	199.8	38,947	649.1
PRoW 9	7,851	130.8	12,585	209.8
Route 10	100,889	1,681.5	96,747	1,612.5
Route 15	2,056	34.3	6,230	103.8

PV: PV array 1 potential temporary after-image

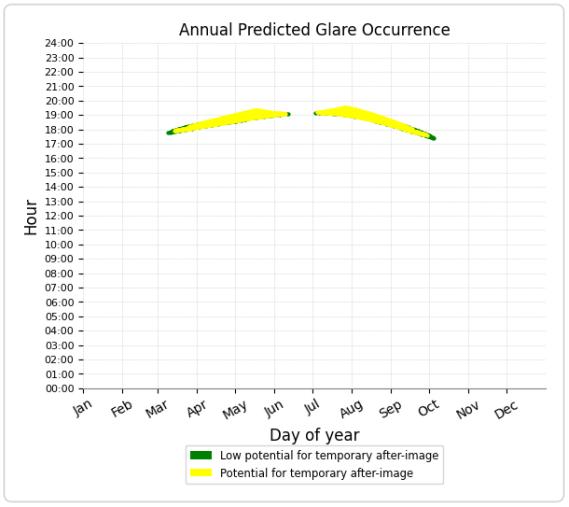
Receptor results ordered by category of glare

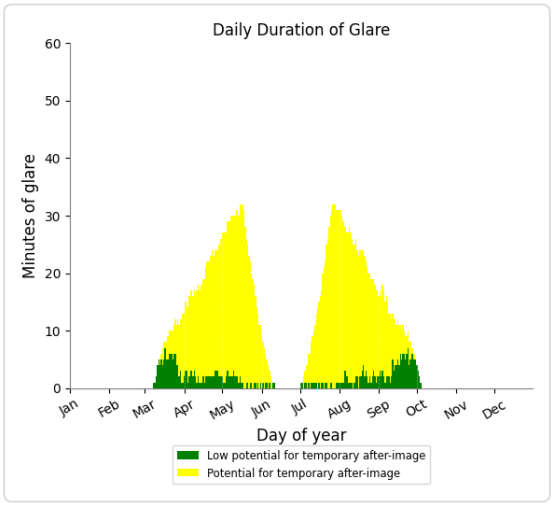
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	406	6.8	2,812	46.9
PRoW 12	745	12.4	564	9.4
PRoW 11	649	10.8	888	14.8
PRoW 13	1,242	20.7	23	0.4
PRoW 14	2,486	41.4	1,331	22.2
PRoW 2	37	0.6	4,158	69.3
PRoW 3	116	1.9	3,223	53.7
PRoW 4	109	1.8	3,321	55.4
PRoW 6	7	0.1	2,254	37.6
PRoW 8	1,096	18.3	3,527	58.8
PRoW 9	1,908	31.8	3,415	56.9
Route 10	1,728	28.8	1,914	31.9
Route 15	894	14.9	67	1.1
PRoW 5	0	0.0	0	0.0
PRoW 7	0	0.0	0	0.0

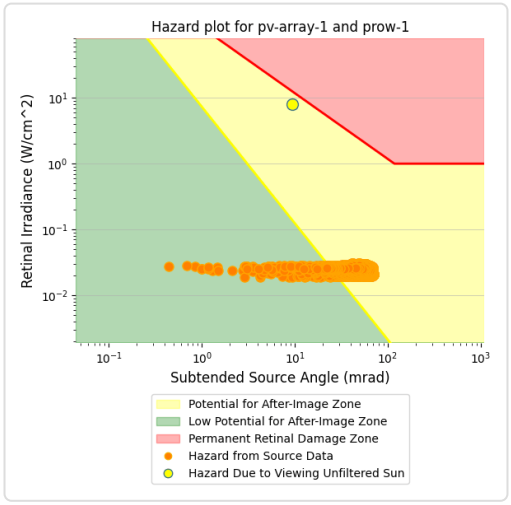
PV array 1 and Route: PRoW 1

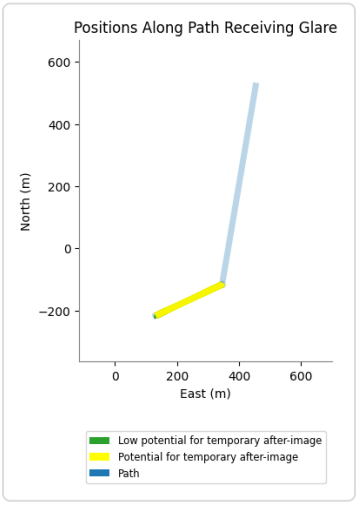
Yellow glare: 2,812 min.

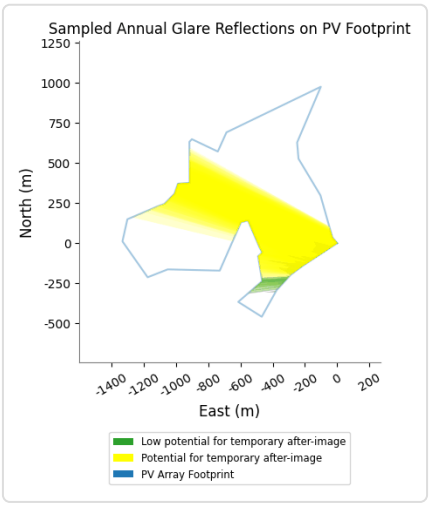
Green glare: 406 min.







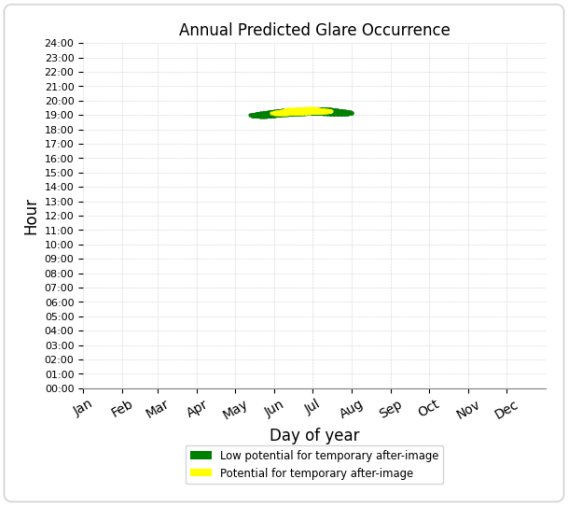


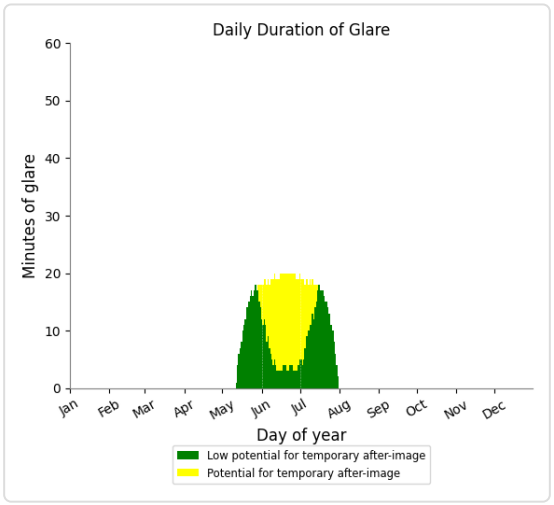


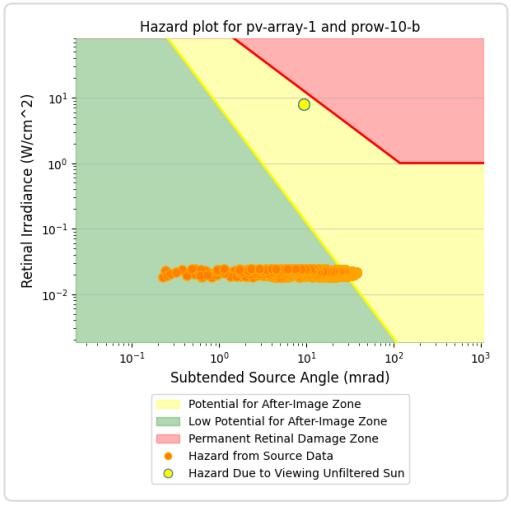
PV array 1 and Route: PRoW 12

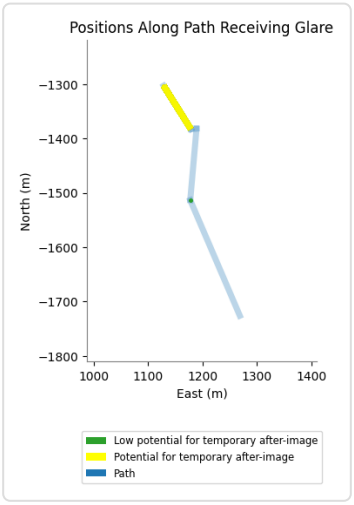
Yellow glare: 564 min.

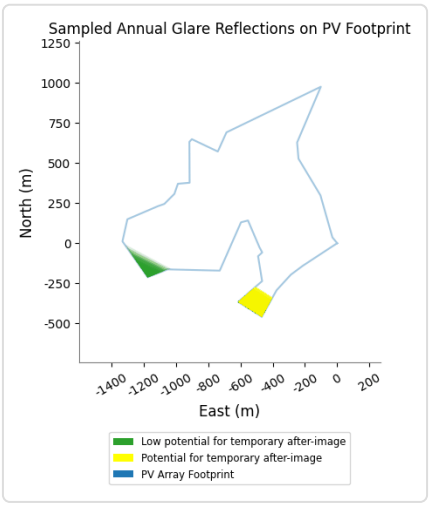
Green glare: 745 min.







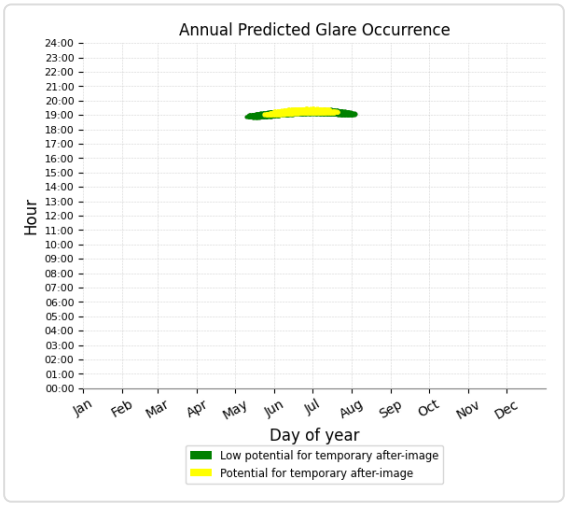


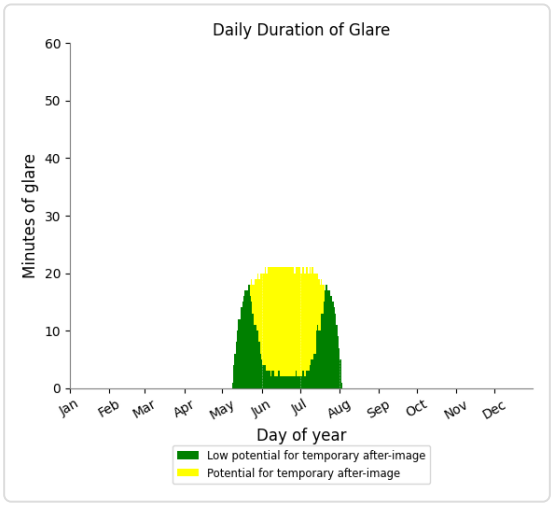


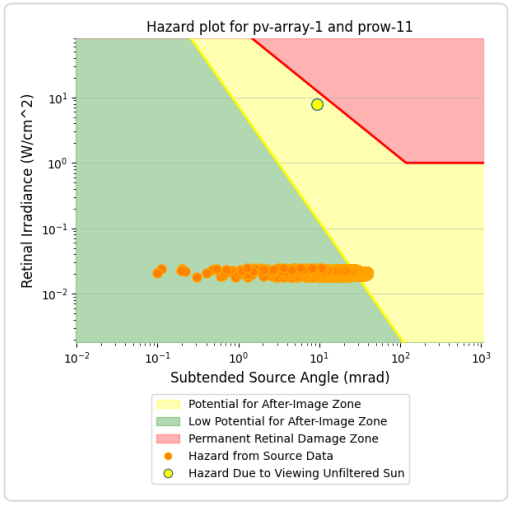
PV array 1 and Route: PRoW 11

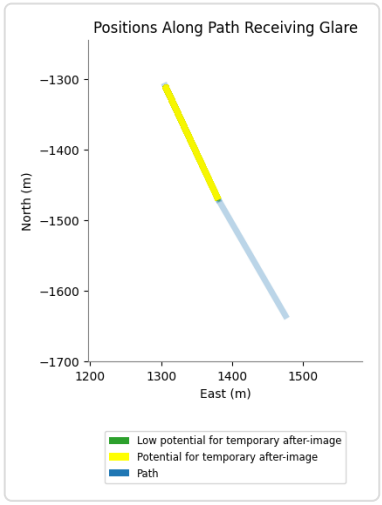
Yellow glare: 888 min.

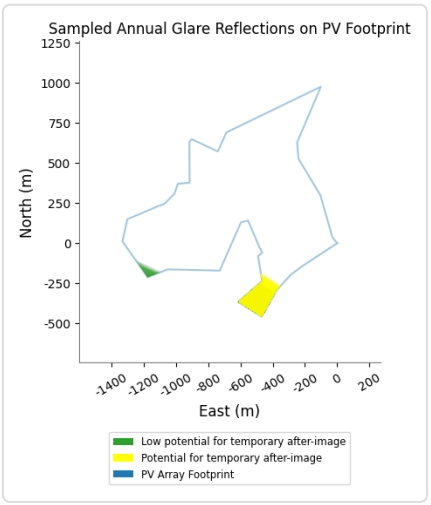
Green glare: 649 min.







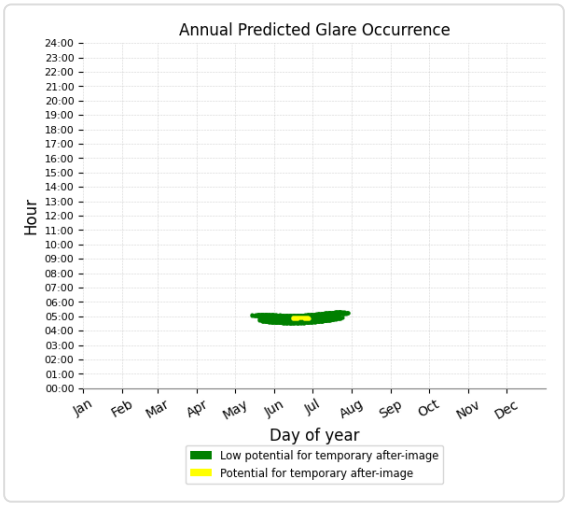


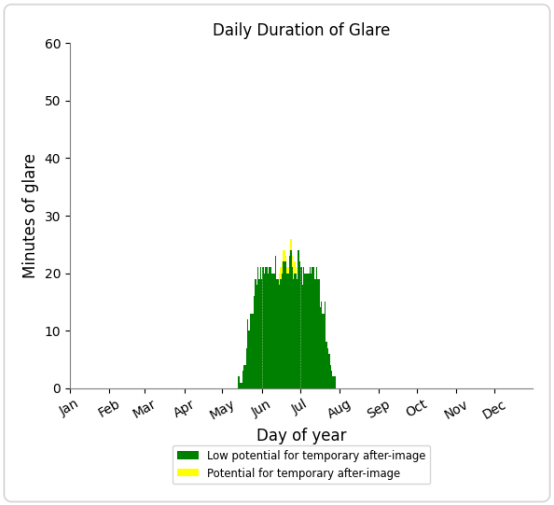


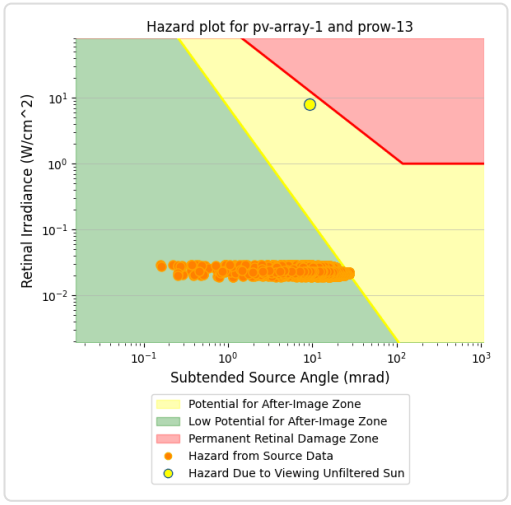
PV array 1 and Route: PRoW 13

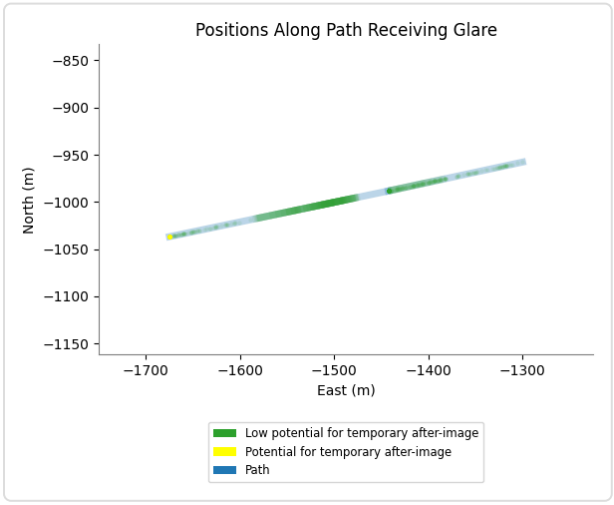
Yellow glare: 23 min.

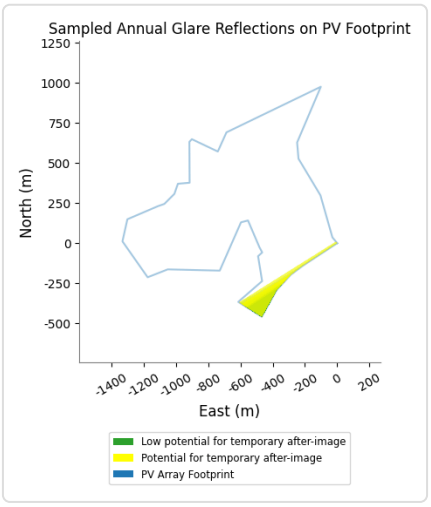
Green glare: 1,242 min.







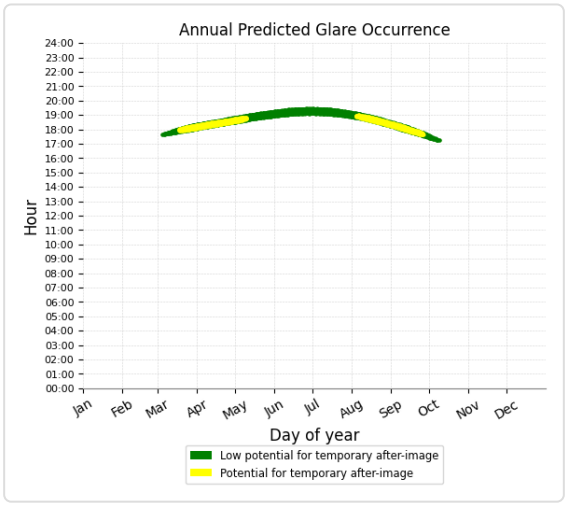


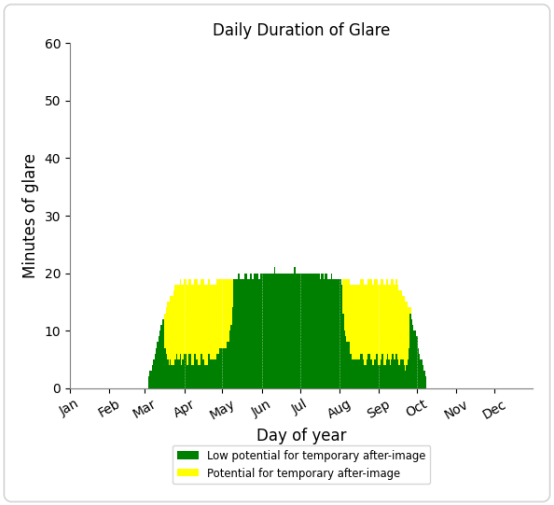


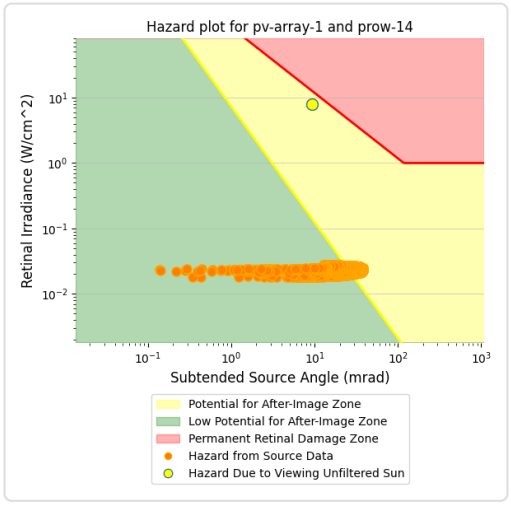
PV array 1 and Route: PRoW 14

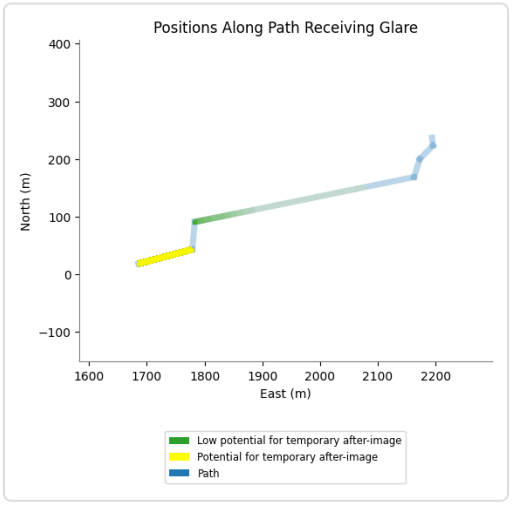
Yellow glare: 1,331 min.

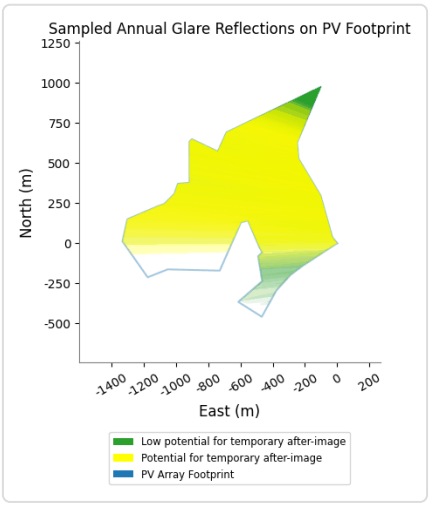
Green glare: 2,486 min.







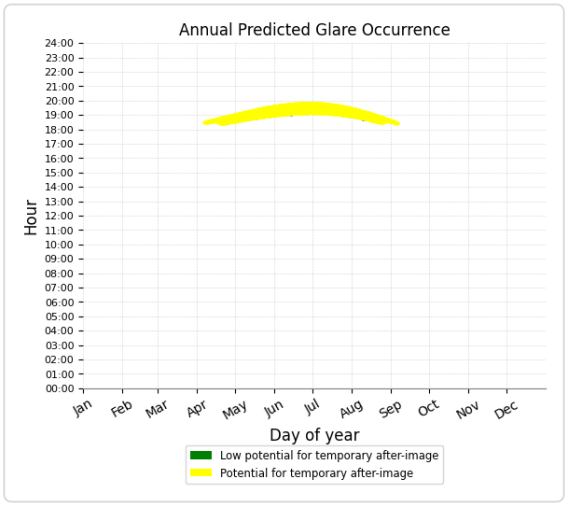


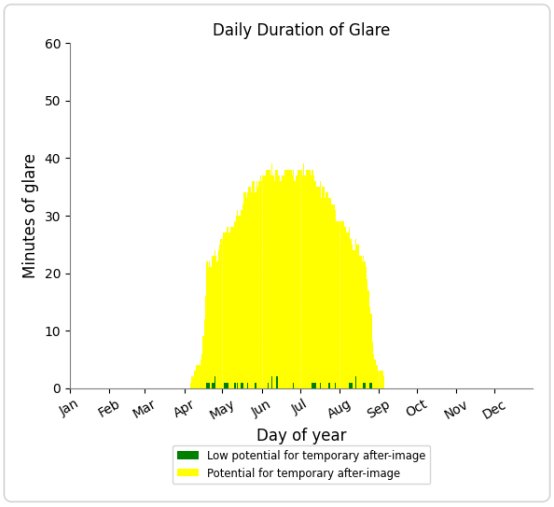


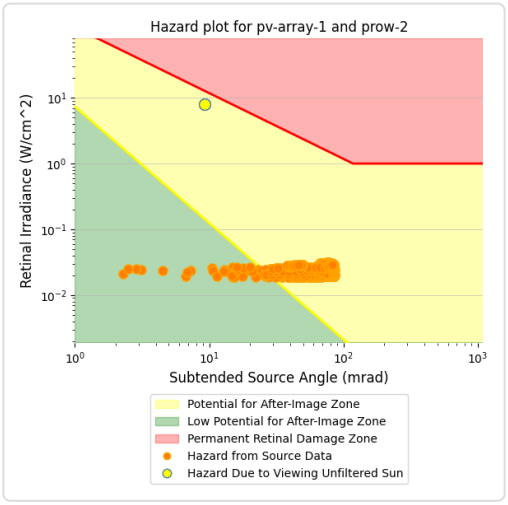
PV array 1 and Route: PRoW 2

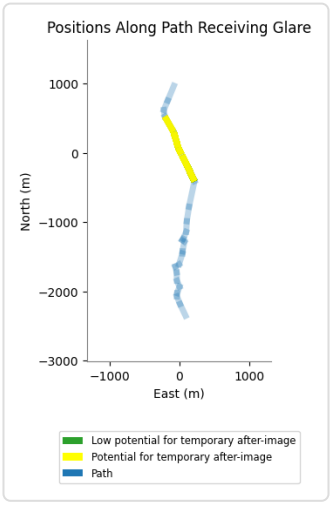
Yellow glare: 4,158 min.

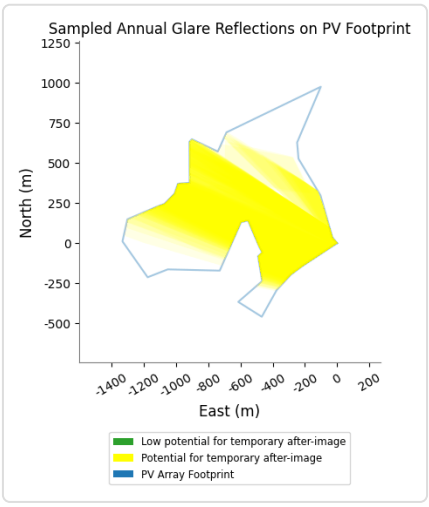
Green glare: 37 min.







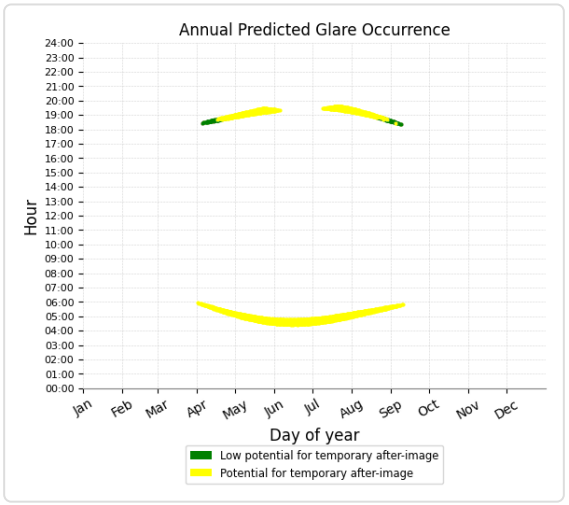


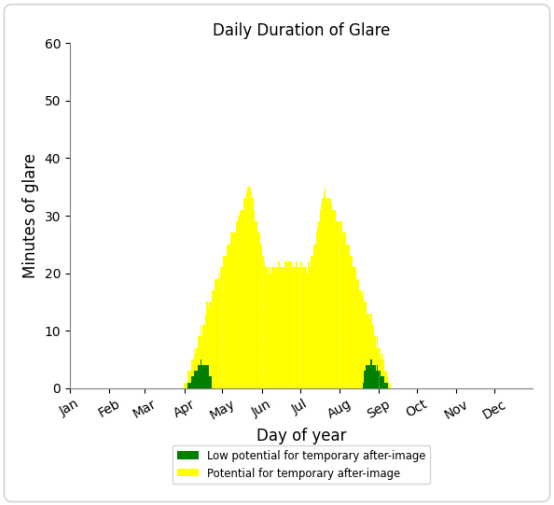


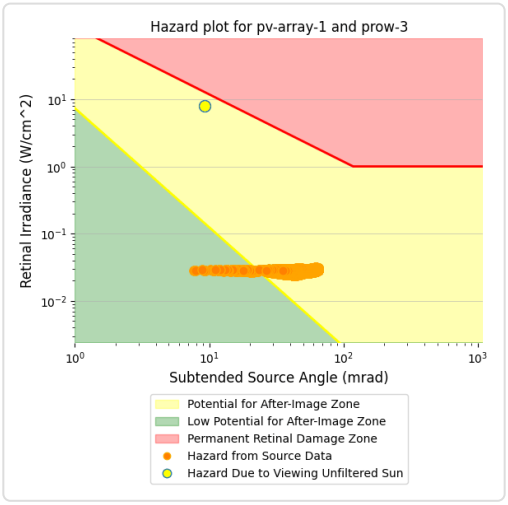
PV array 1 and Route: PRoW 3

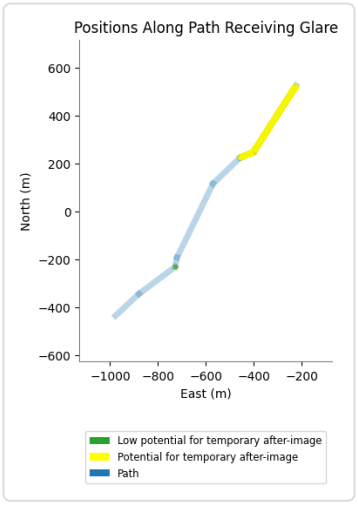
Yellow glare: 3,223 min.

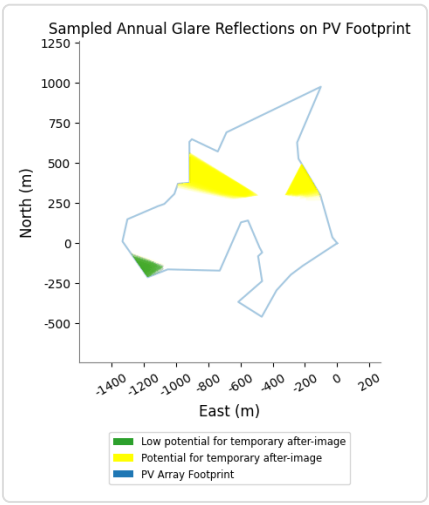
Green glare: 116 min.







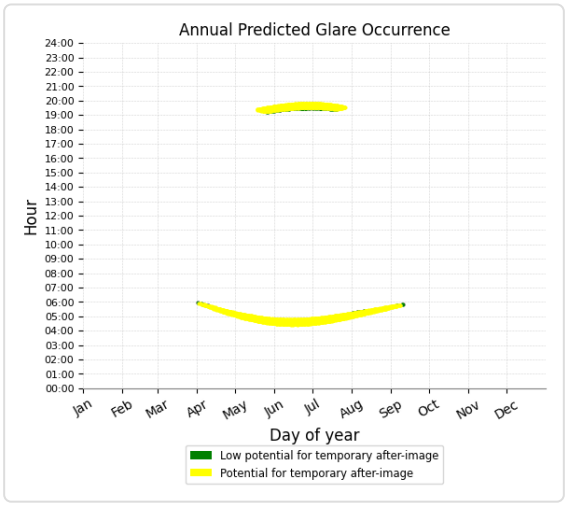


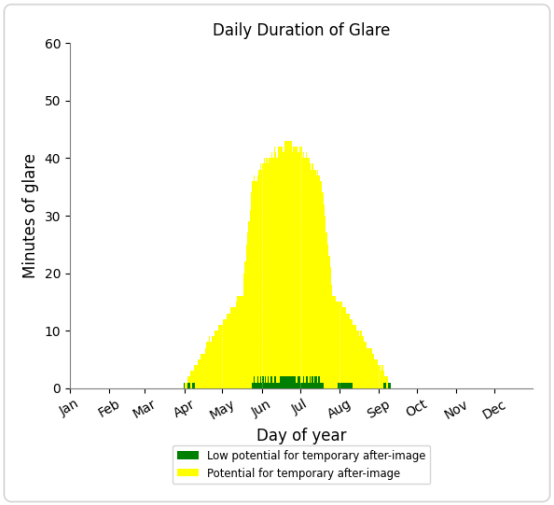


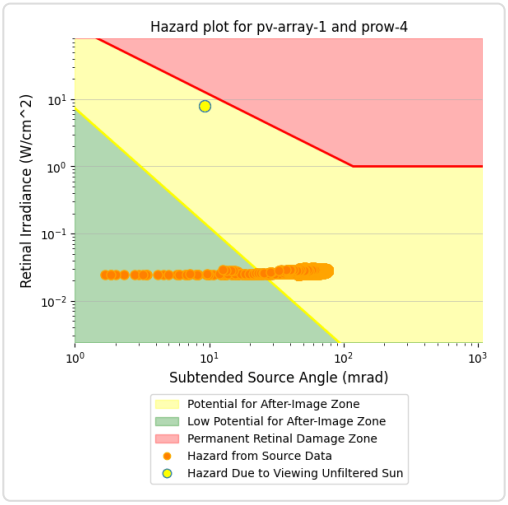
PV array 1 and Route: PRoW 4

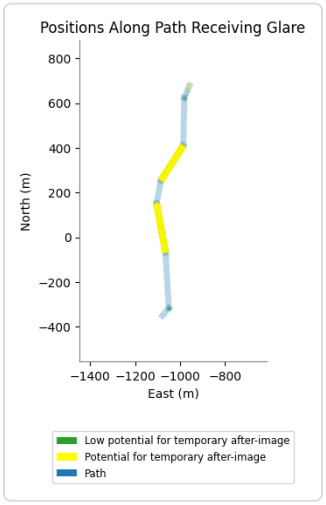
Yellow glare: 3,321 min.

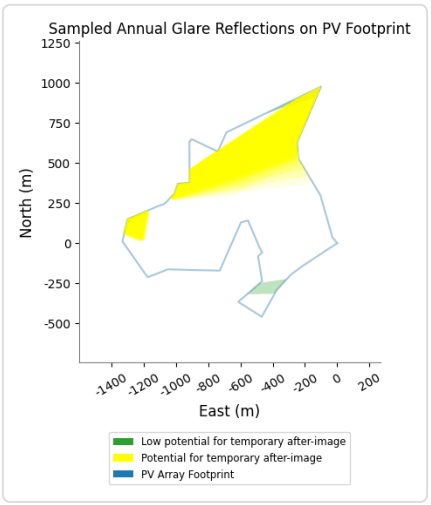
Green glare: 109 min.







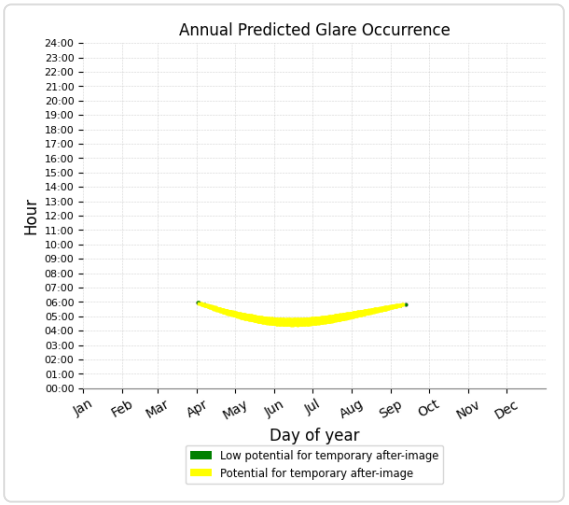


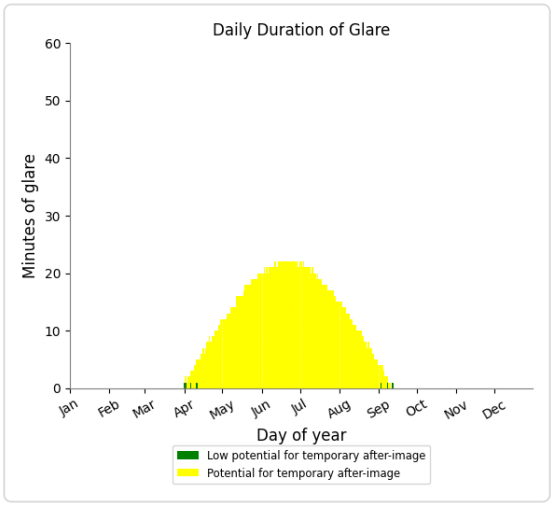


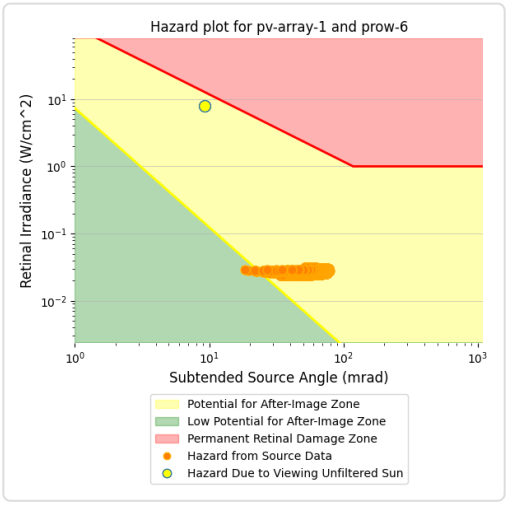
PV array 1 and Route: PRoW 6

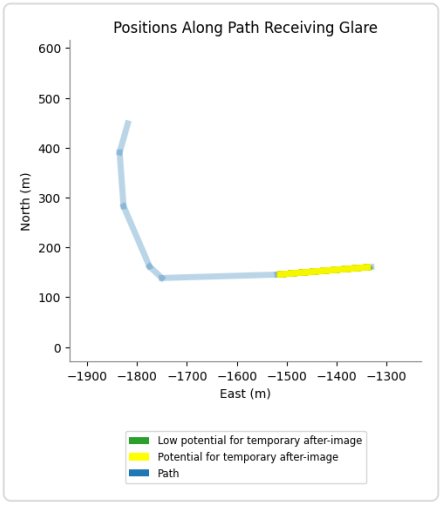
Yellow glare: 2,254 min.

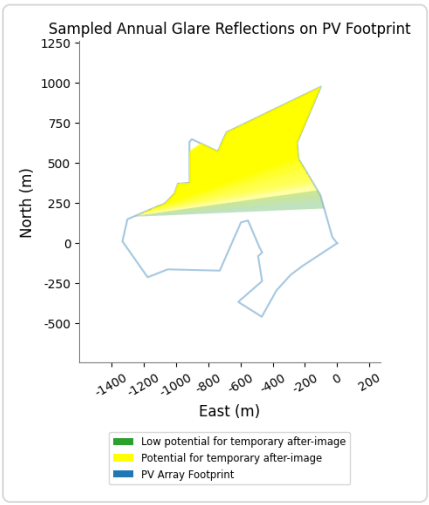
Green glare: 7 min.







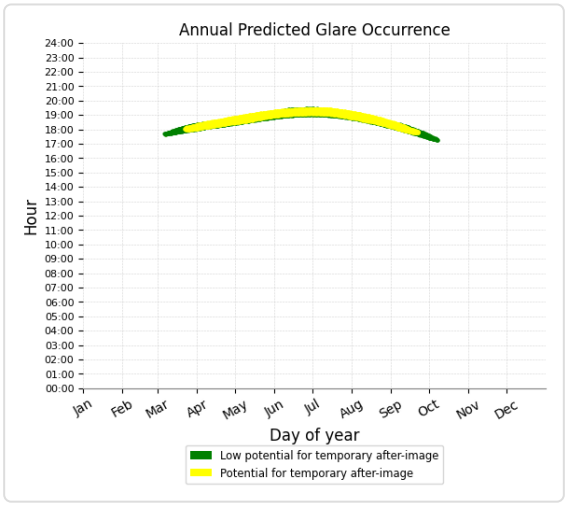


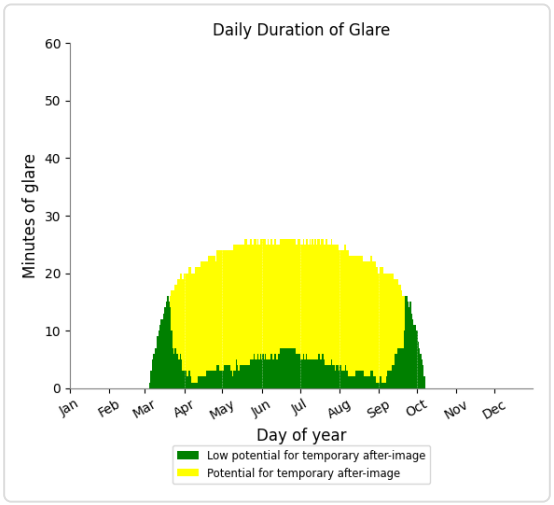


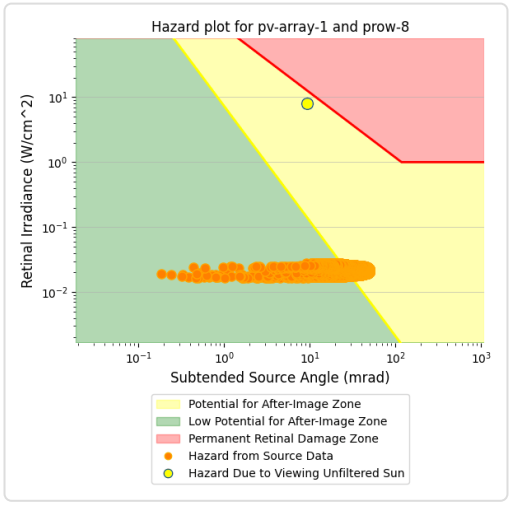
PV array 1 and Route: PRoW 8

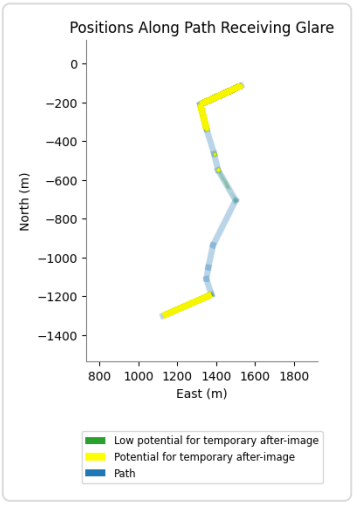
Yellow glare: 3,527 min.

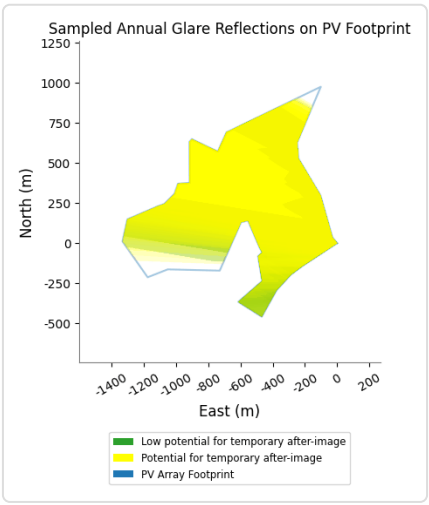
Green glare: 1,096 min.







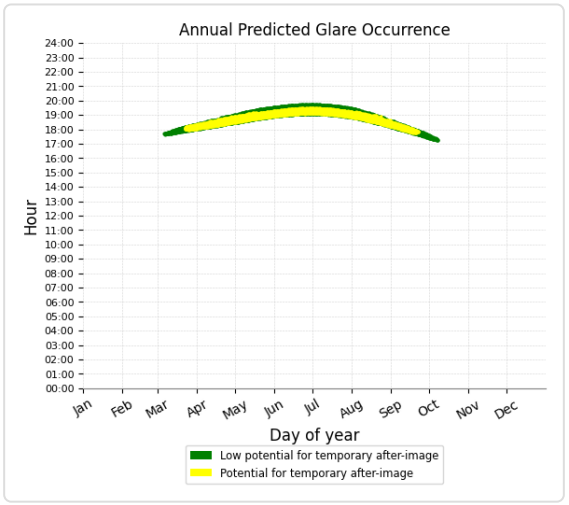


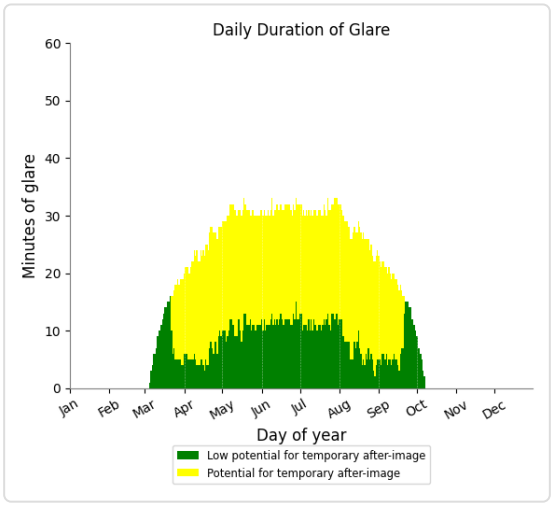


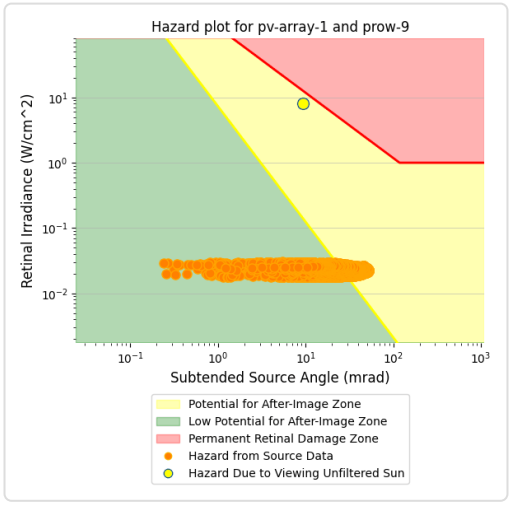
PV array 1 and Route: PRoW 9

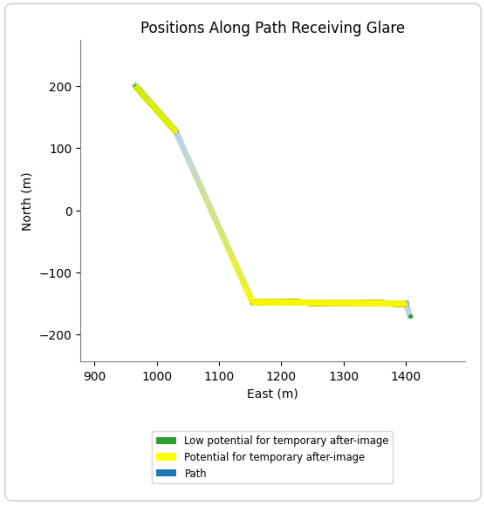
Yellow glare: 3,415 min.

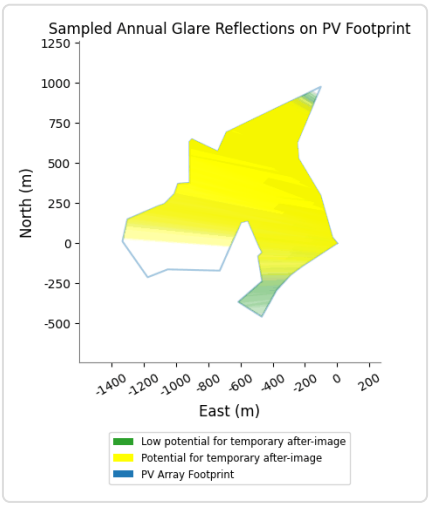
Green glare: 1,908 min.







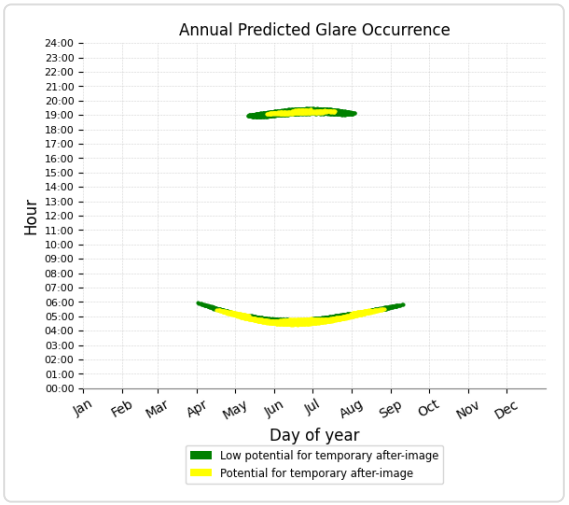


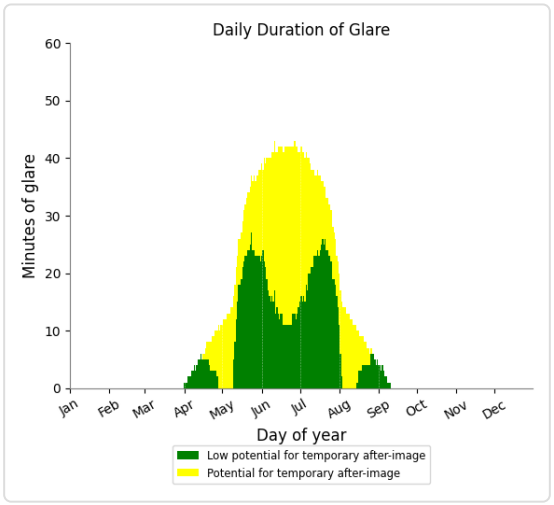


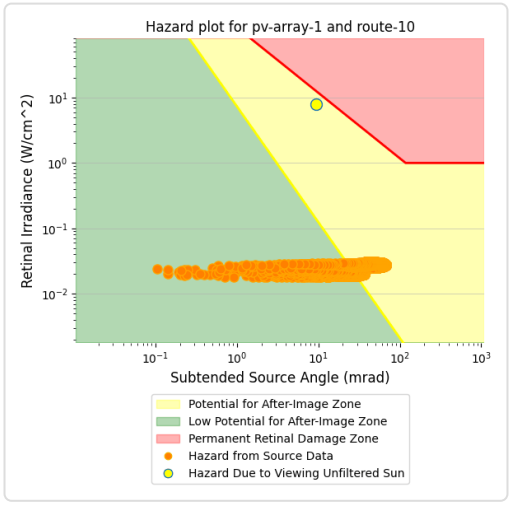
PV array 1 and Route: Route 10

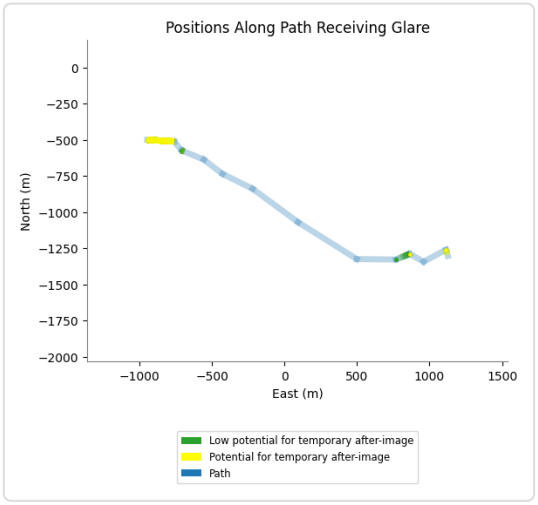
Yellow glare: 1,914 min.

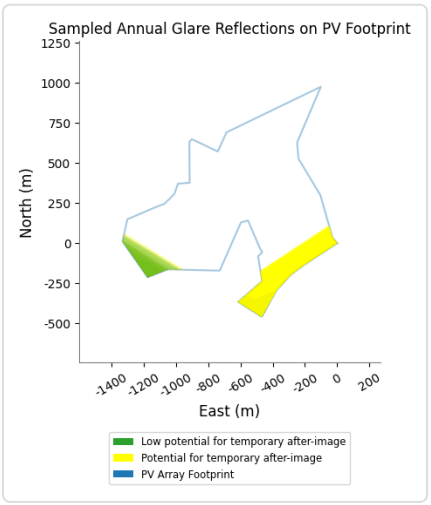
Green glare: 1,728 min.







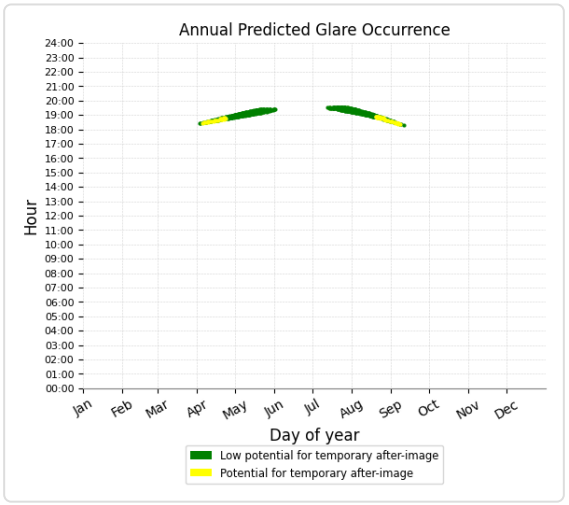


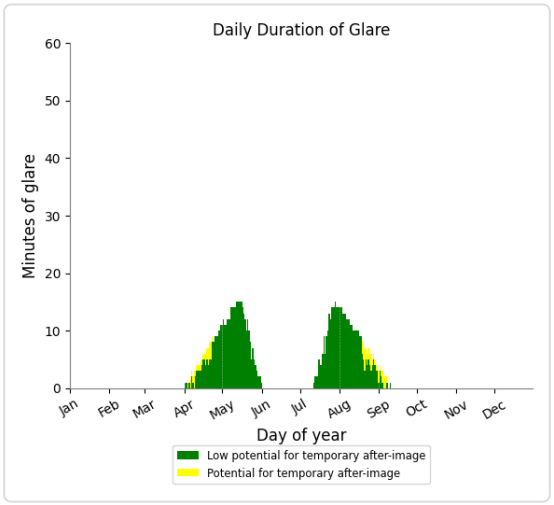


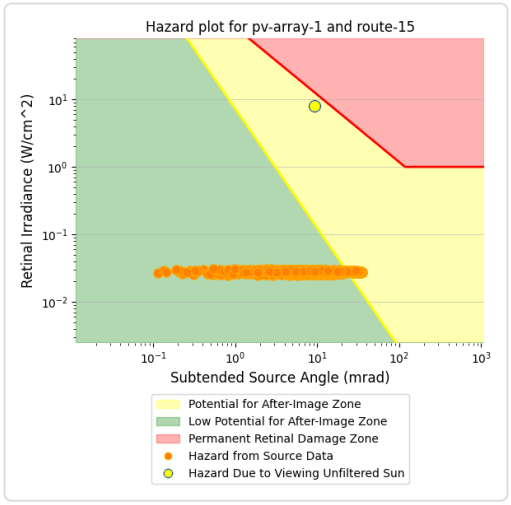
PV array 1 and Route: Route 15

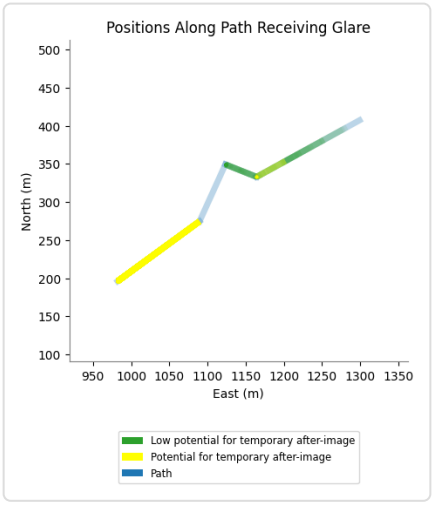
Yellow glare: 67 min.

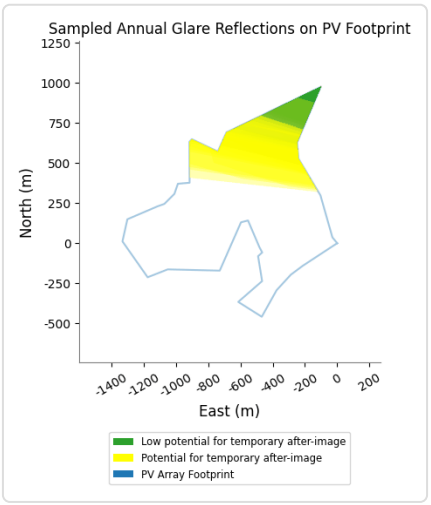
Green glare: 894 min.











PV array 1 and Route: PRoW 5

No glare found

PV array 1 and Route: PRoW 7

No glare found

PV: PV array 2 potential temporary after-image

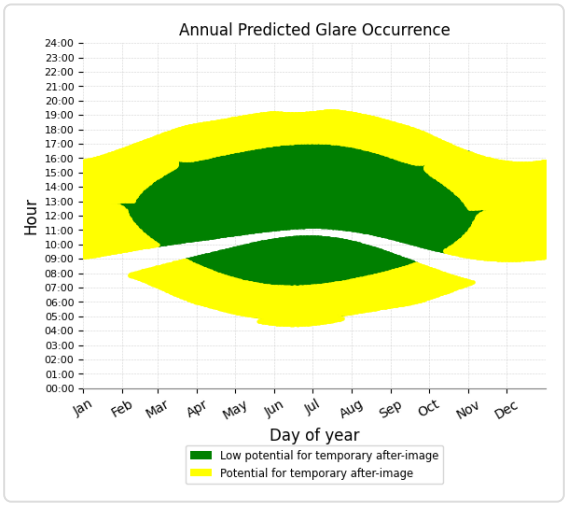
Receptor results ordered by category of glare

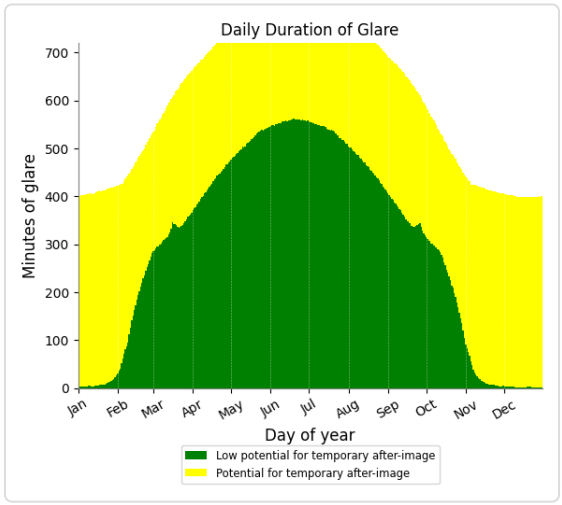
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	110,263	1,837.7	113,348	1,889.1
PRoW 12	1,271	21.2	3,895	64.9
PRoW 11	431	7.2	3,199	53.3
PRoW 13	508	8.5	2,560	42.7
PRoW 14	2,080	34.7	4,105	68.4
PRoW 2	96,150	1,602.5	100,826	1,680.4
PRoW 3	5,404	90.1	14,878	248.0
PRoW 4	1,861	31.0	1,282	21.4
PRoW 5	83	1.4	239	4.0
PRoW 6	1,472	24.5	949	15.8
PRoW 7	2,386	39.8	2,877	48.0
PRoW 8	1,055	17.6	7,727	128.8
PRoW 9	3,162	52.7	6,096	101.6
Route 10	95,292	1,588.2	91,506	1,525.1
Route 15	800	13.3	5,797	96.6

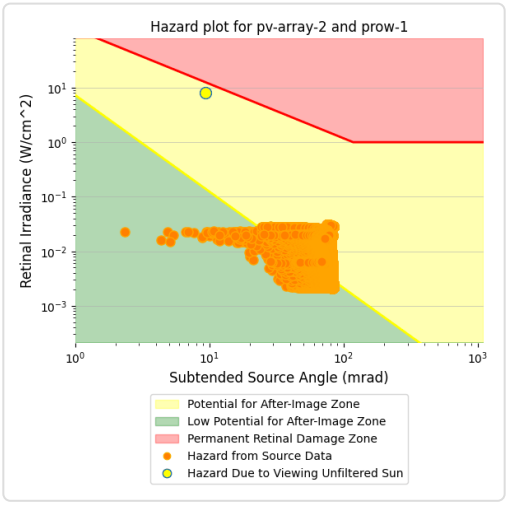
PV array 2 and Route: PRoW 1

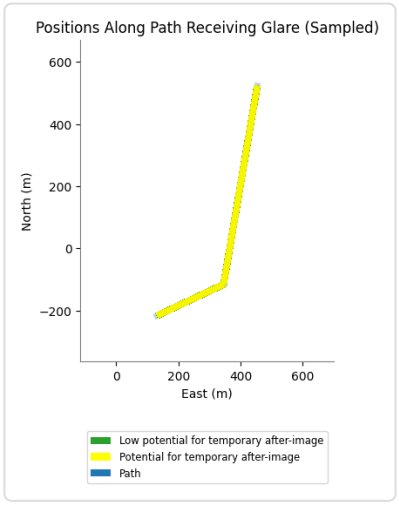
Yellow glare: 113,348 min.

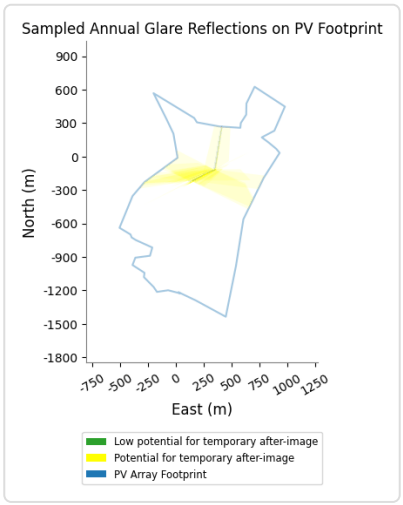
Green glare: 110,263 min.







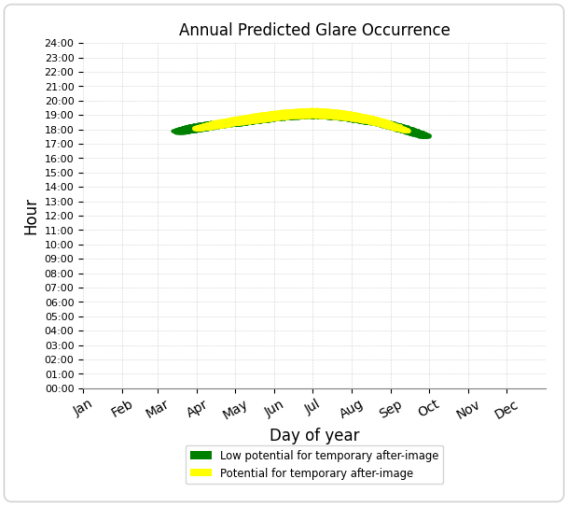


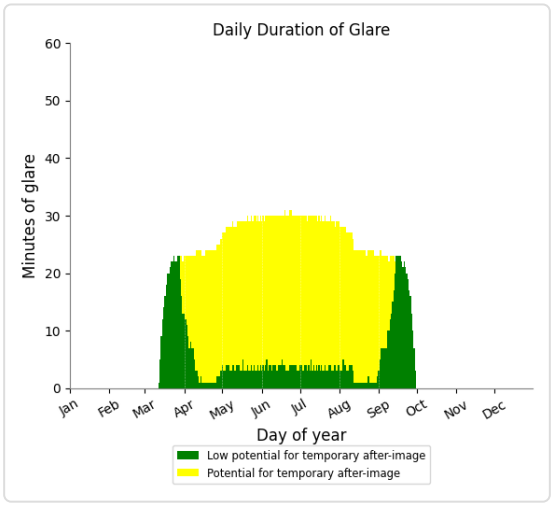


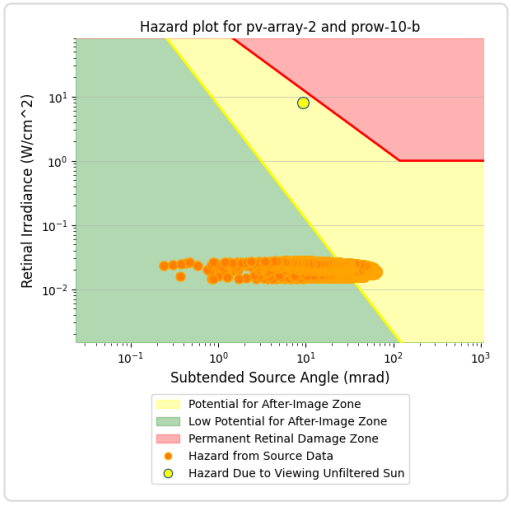
PV array 2 and Route: PRoW 12

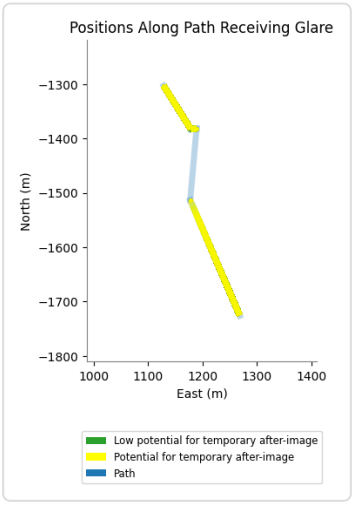
Yellow glare: 3,895 min.

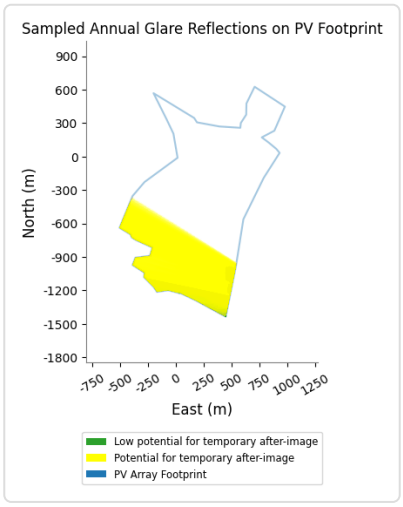
Green glare: 1,271 min.







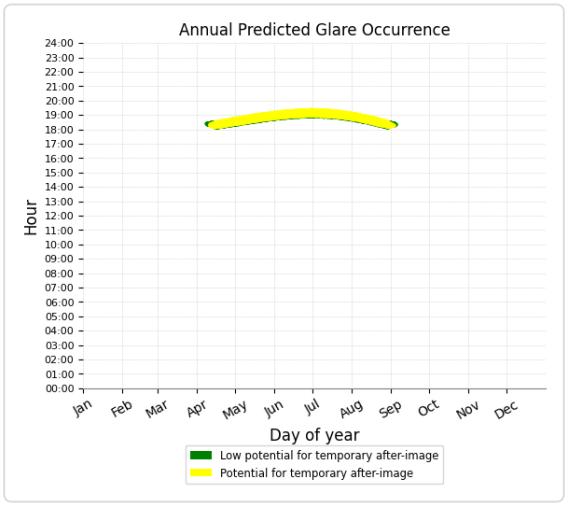


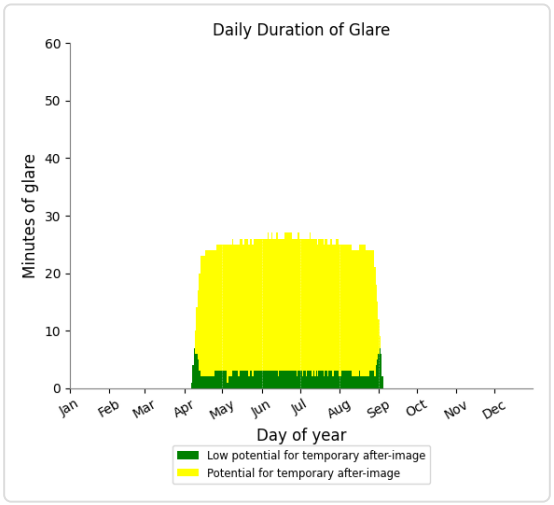


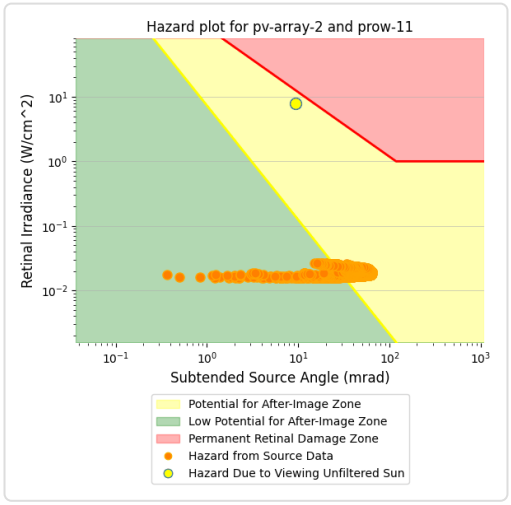
PV array 2 and Route: PRoW 11

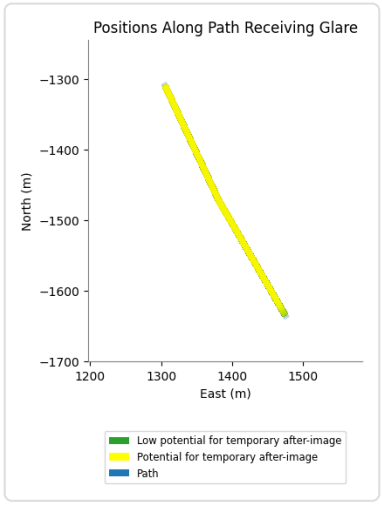
Yellow glare: 3,199 min.

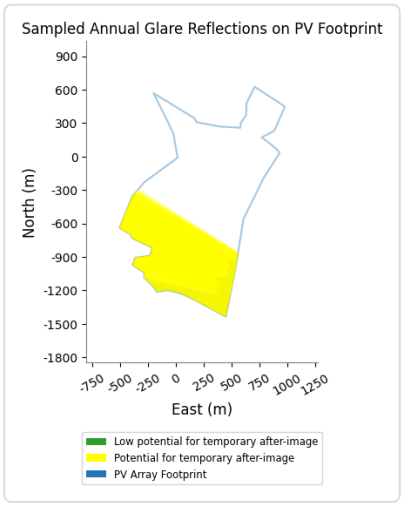
Green glare: 431 min.







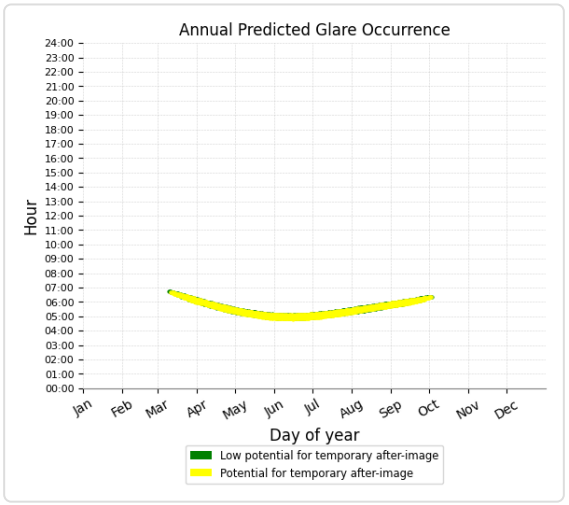


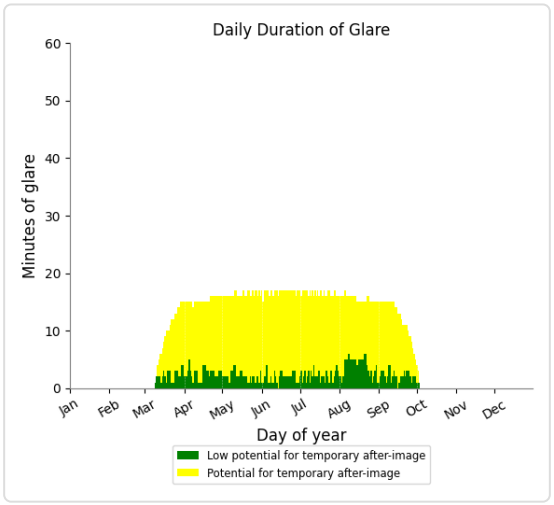


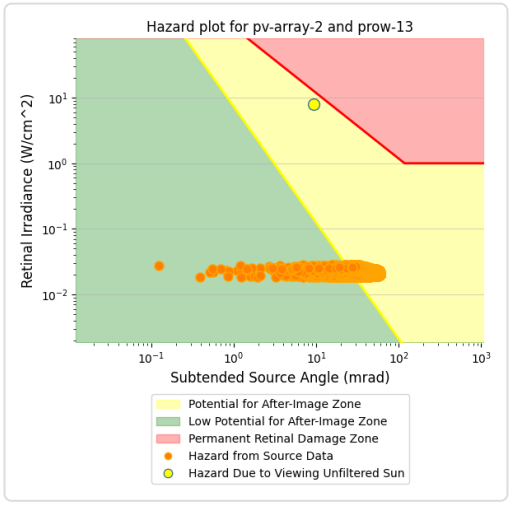
PV array 2 and Route: PRoW 13

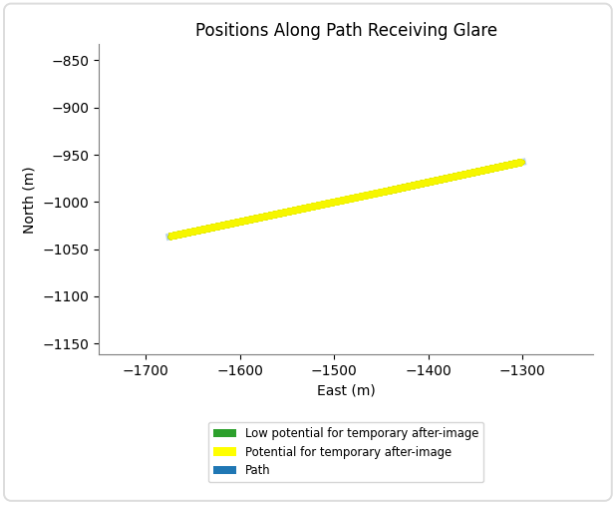
Yellow glare: 2,560 min.

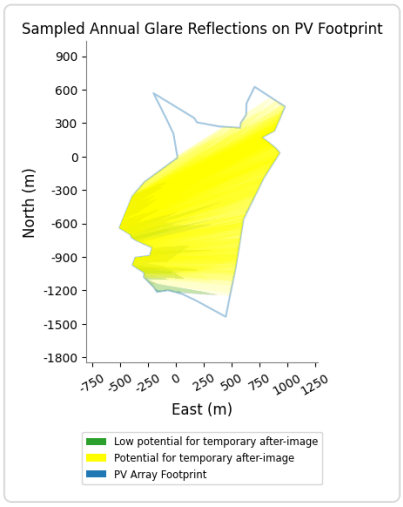
Green glare: 508 min.







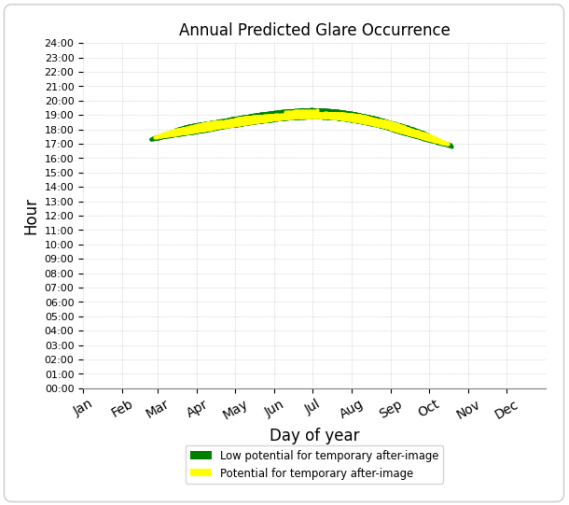


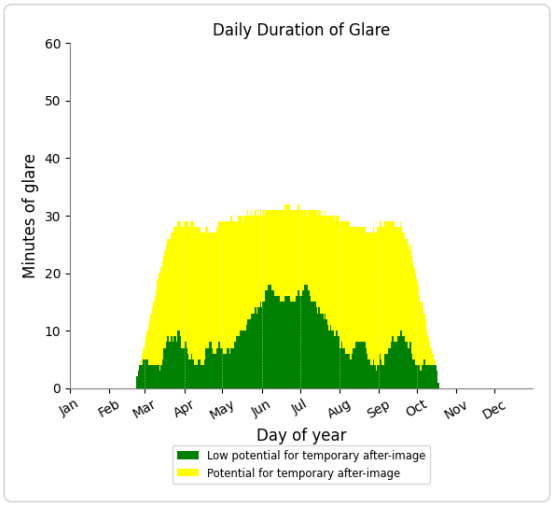


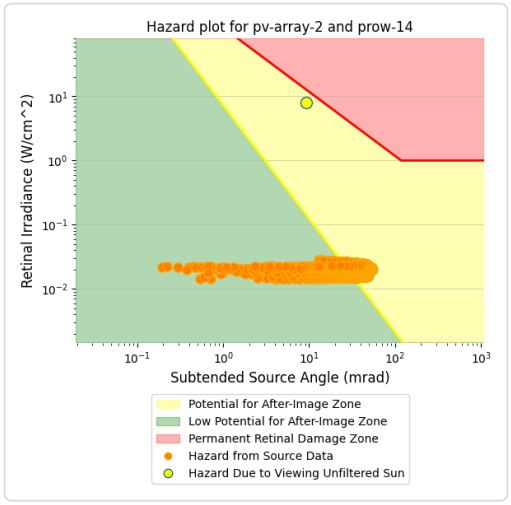
PV array 2 and Route: PRoW 14

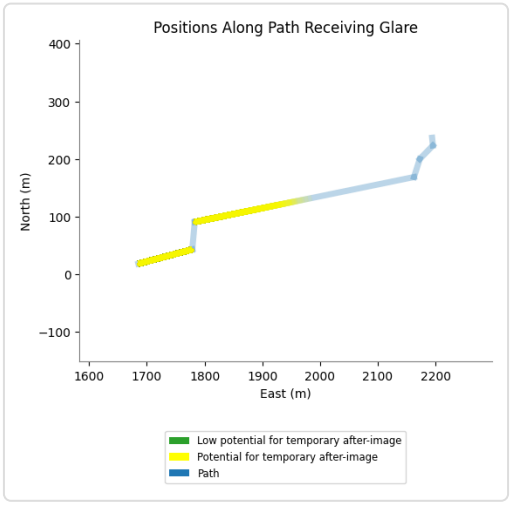
Yellow glare: 4,105 min.

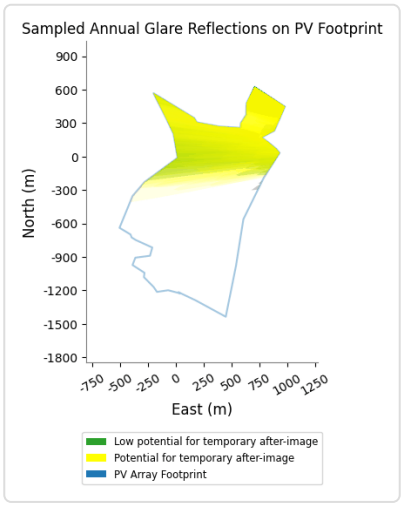
Green glare: 2,080 min.







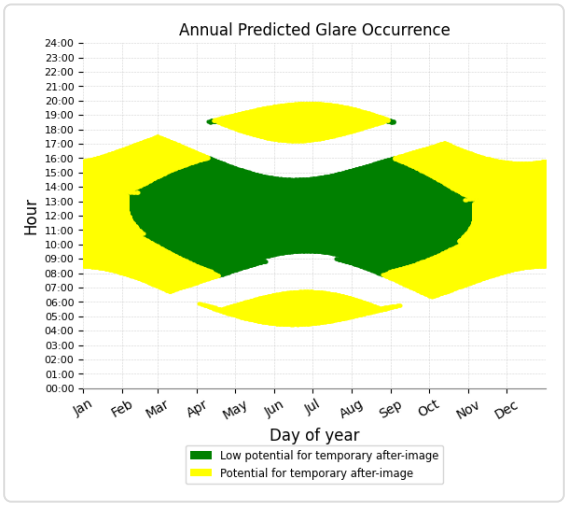


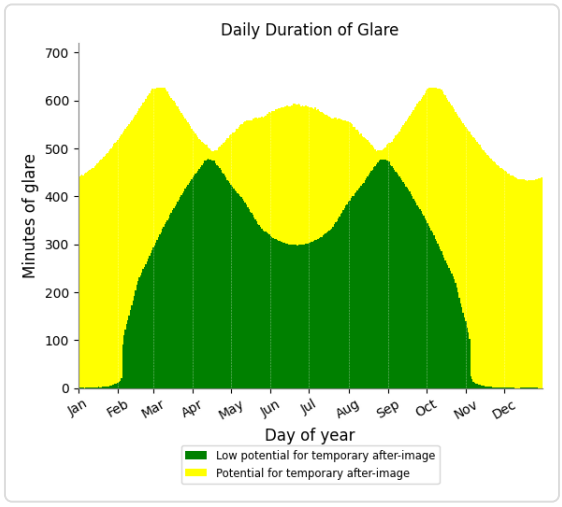


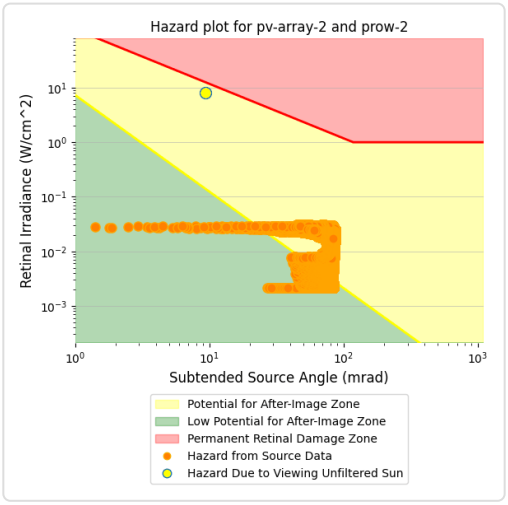
PV array 2 and Route: PRoW 2

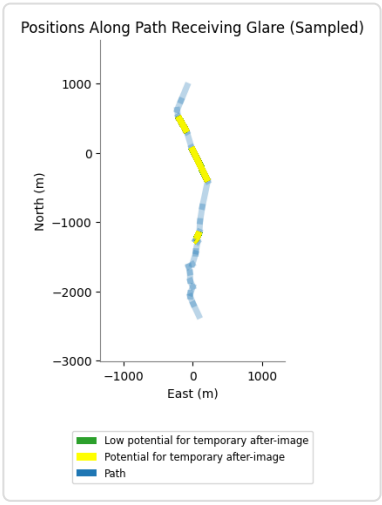
Yellow glare: 100,826 min.

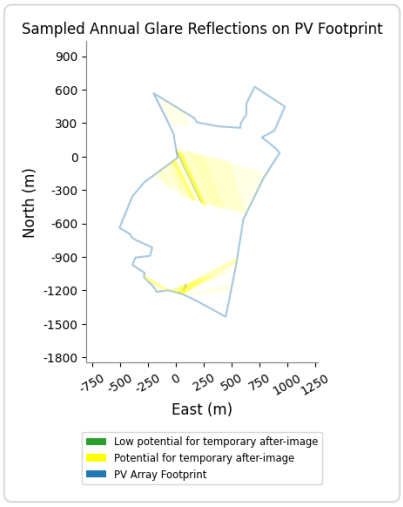
Green glare: 96,150 min.







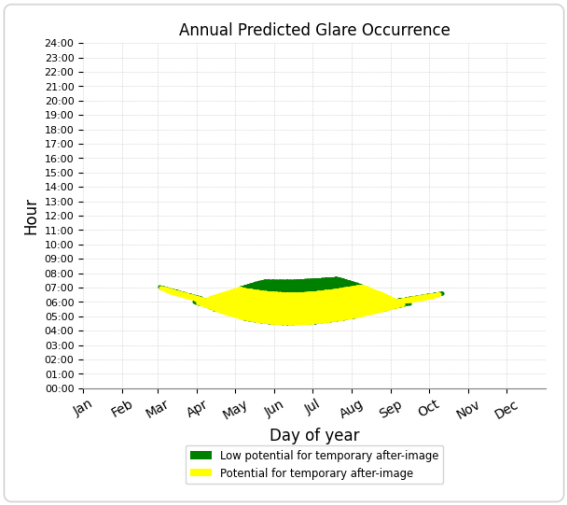


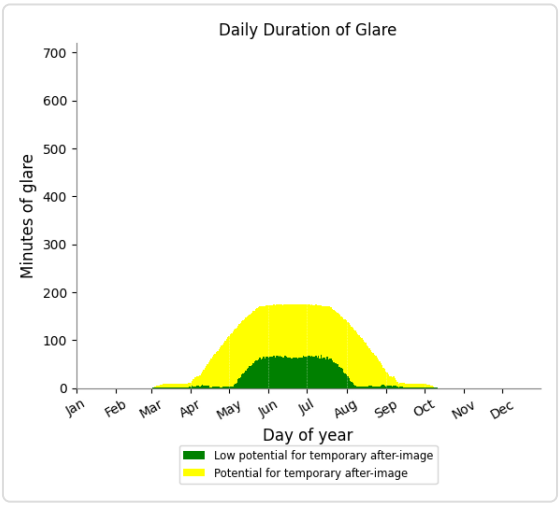


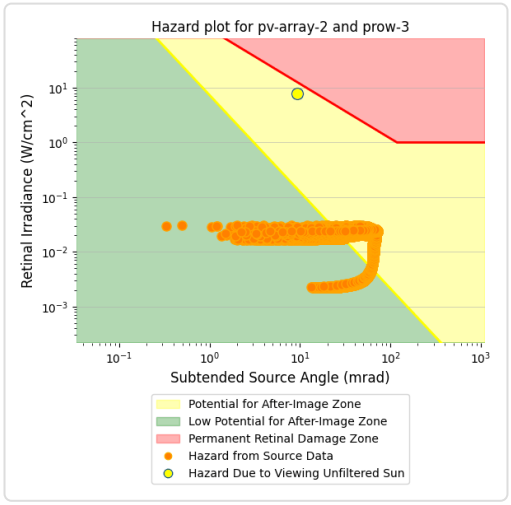
PV array 2 and Route: PRoW 3

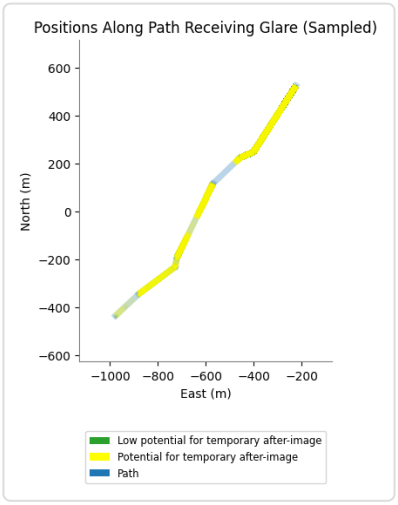
Yellow glare: 14,878 min.

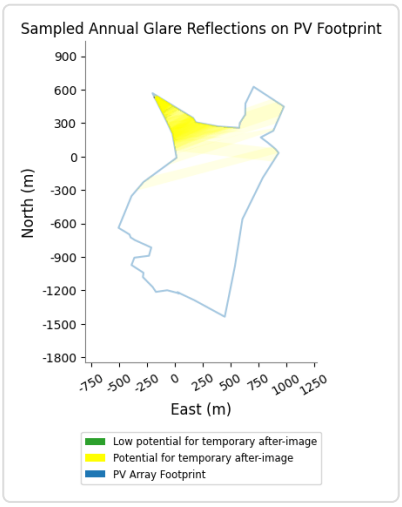
Green glare: 5,404 min.







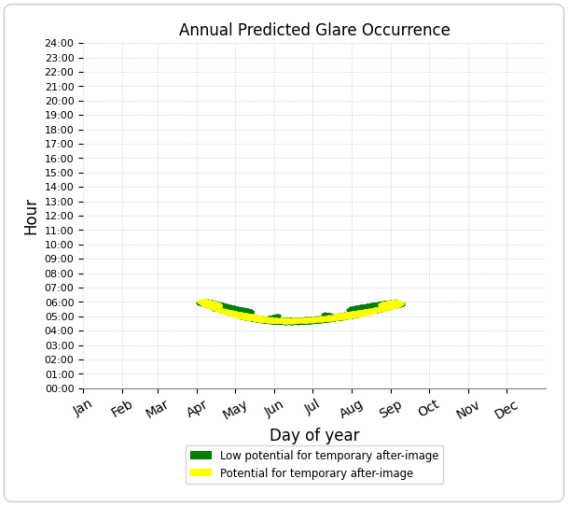


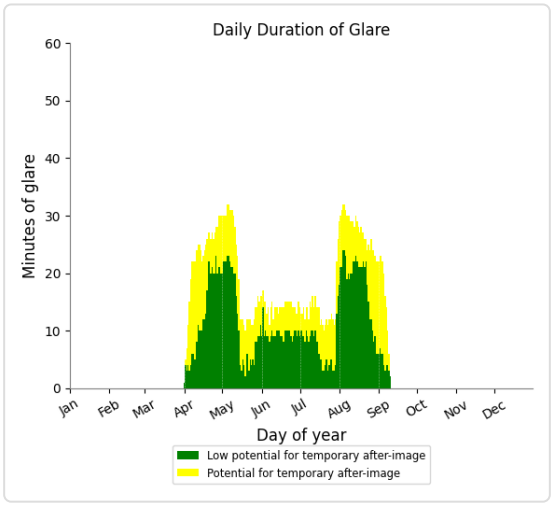


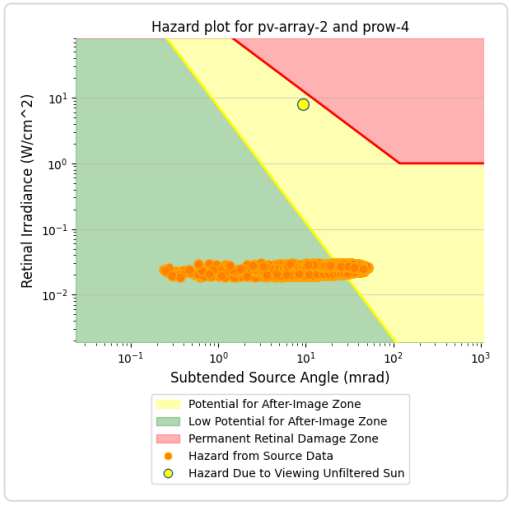
PV array 2 and Route: PRoW 4

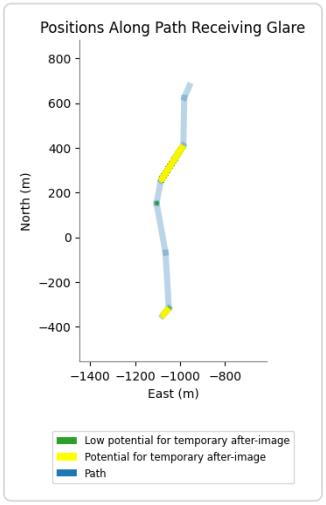
Yellow glare: 1,282 min.

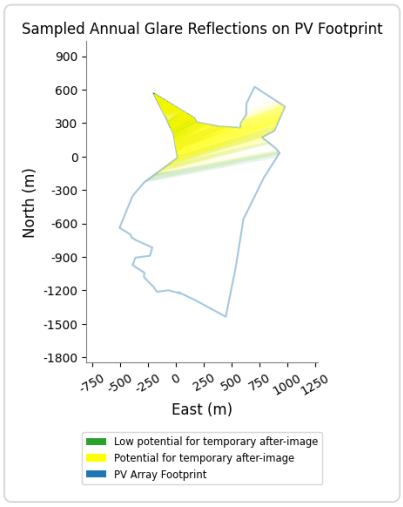
Green glare: 1,861 min.







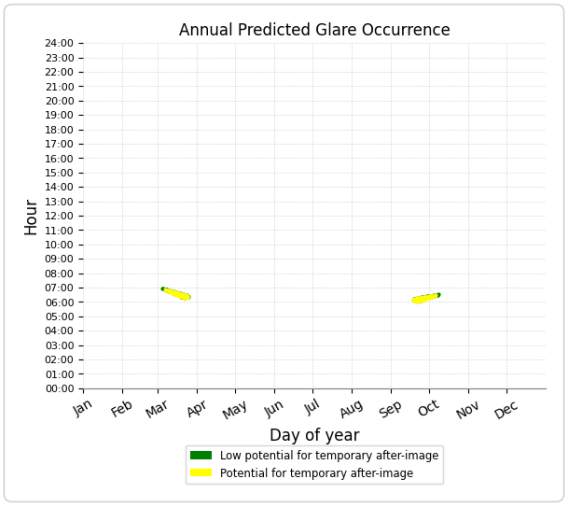


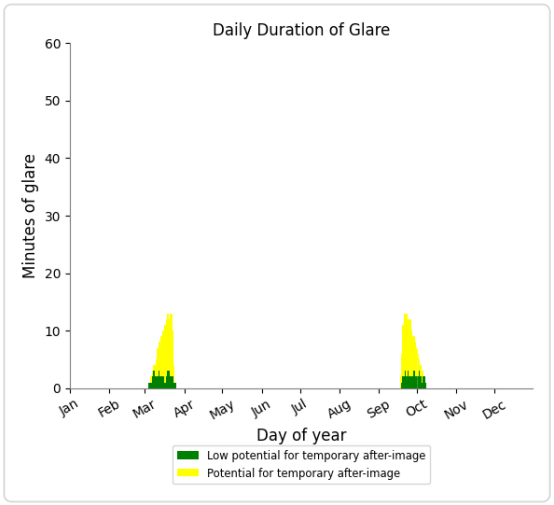


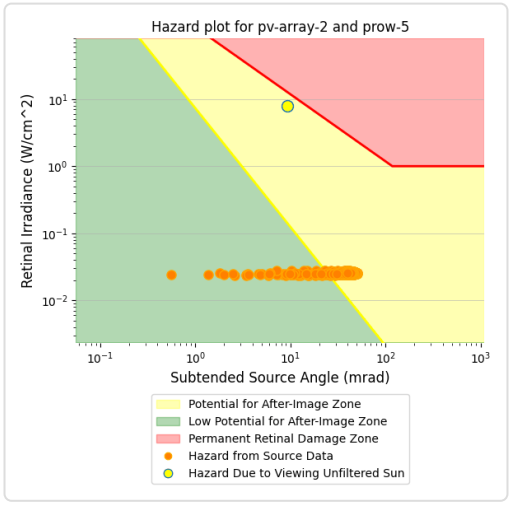
PV array 2 and Route: PRoW 5

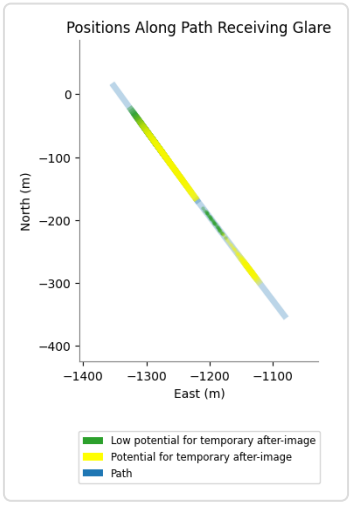
Yellow glare: 239 min.

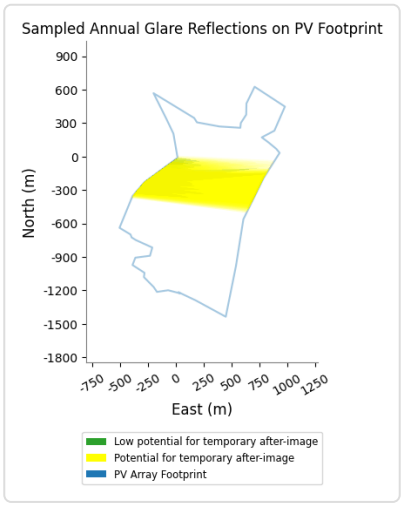
Green glare: 83 min.







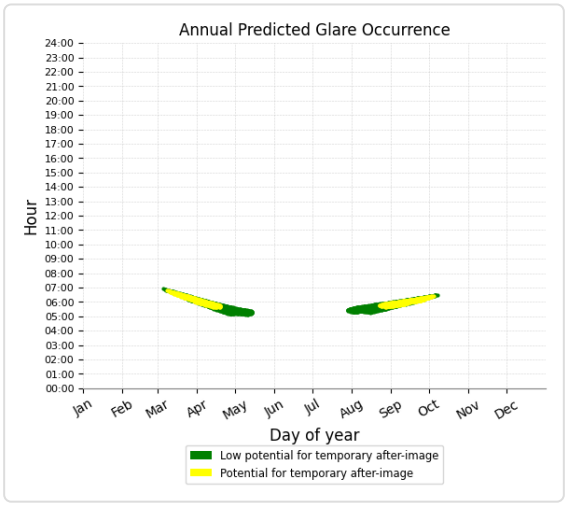


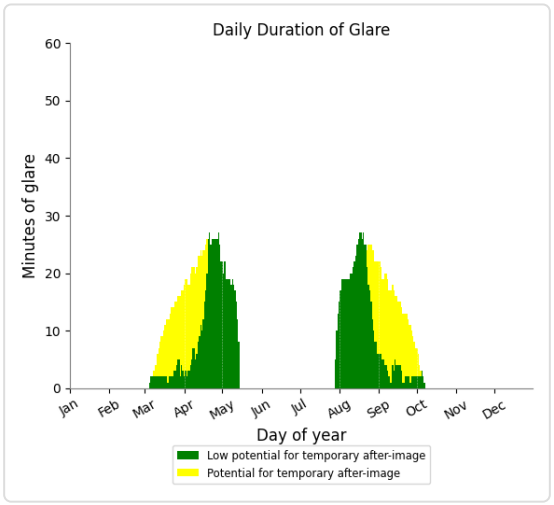


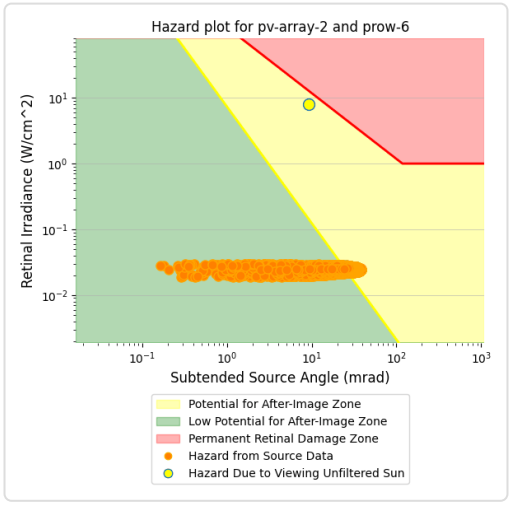
PV array 2 and Route: PRoW 6

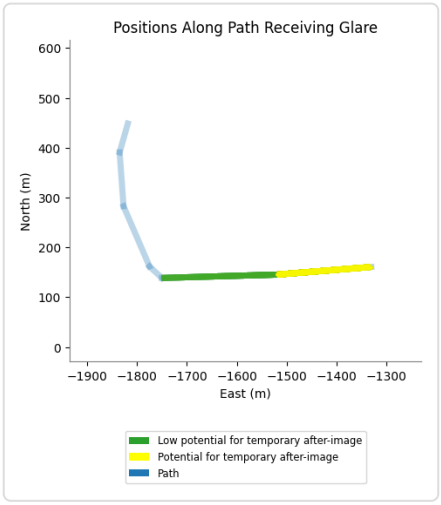
Yellow glare: 949 min.

Green glare: 1,472 min.







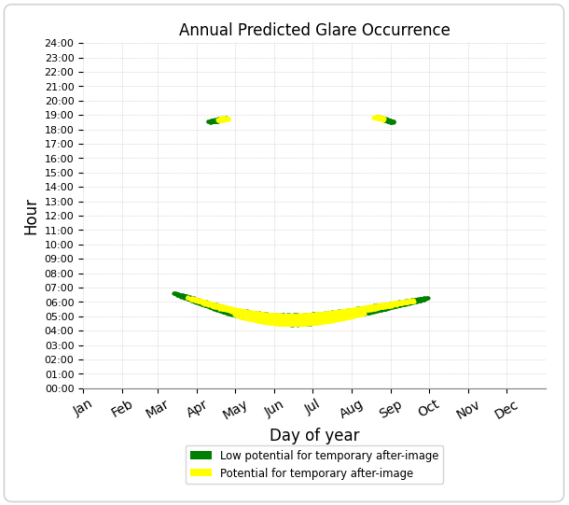


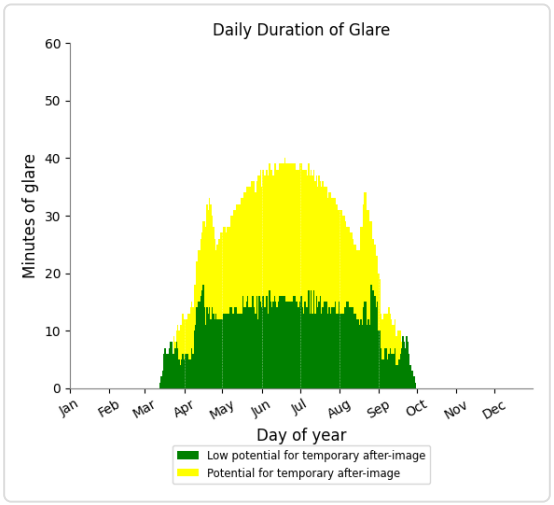


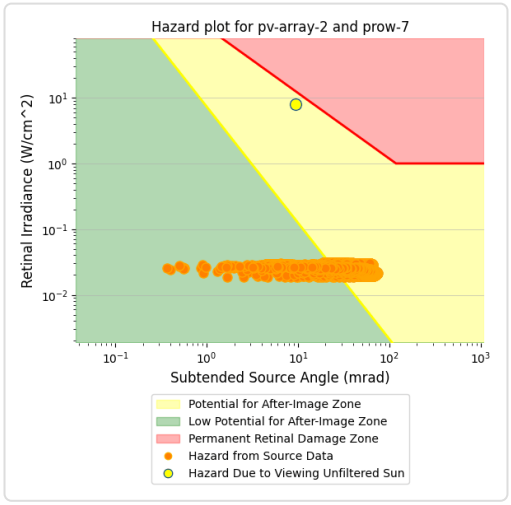
PV array 2 and Route: PRoW 7

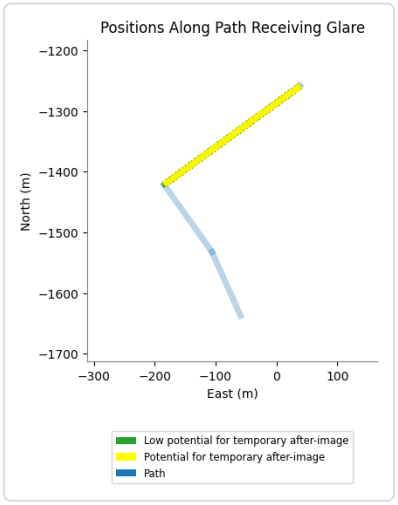
Yellow glare: 2,877 min.

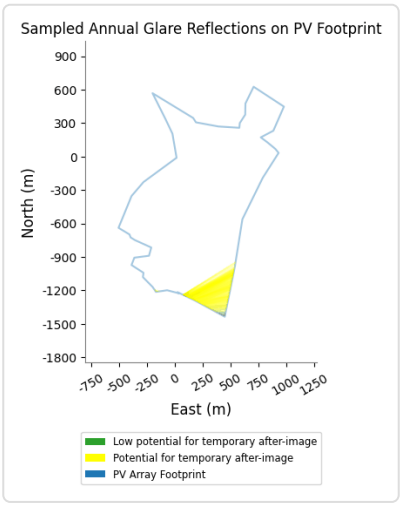
Green glare: 2,386 min.







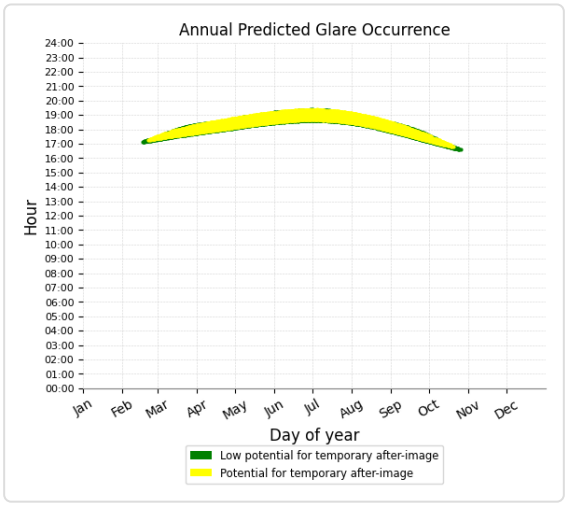


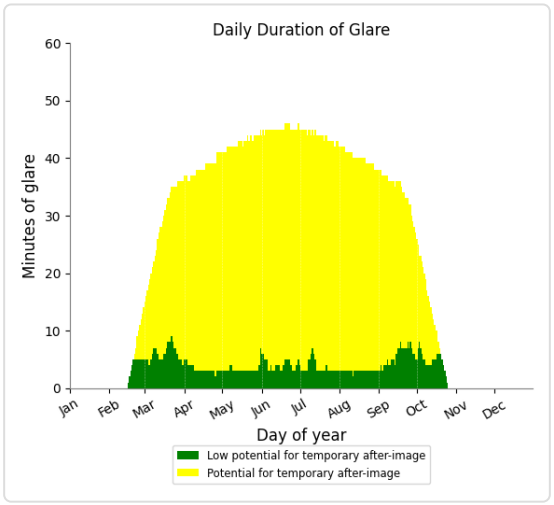


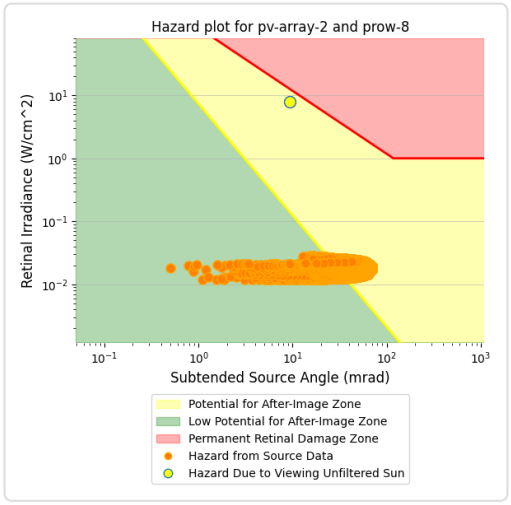
PV array 2 and Route: PRoW 8

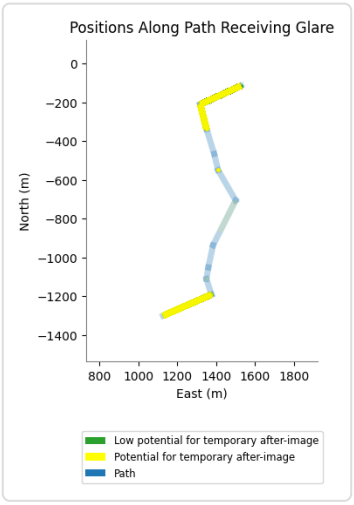
Yellow glare: 7,727 min.

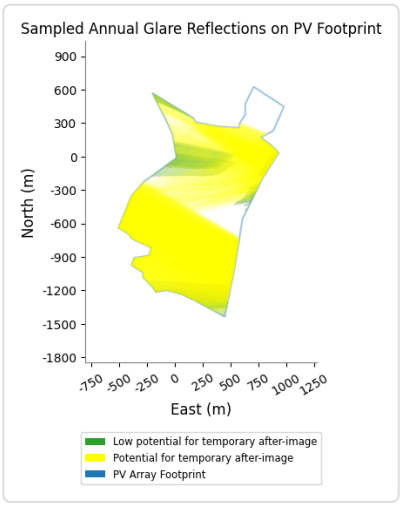
Green glare: 1,055 min.







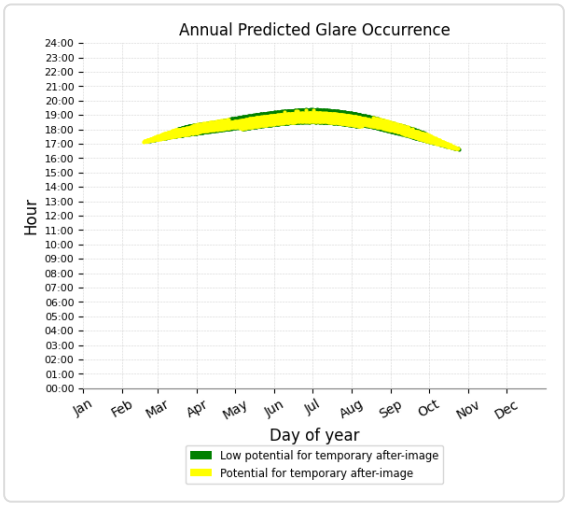


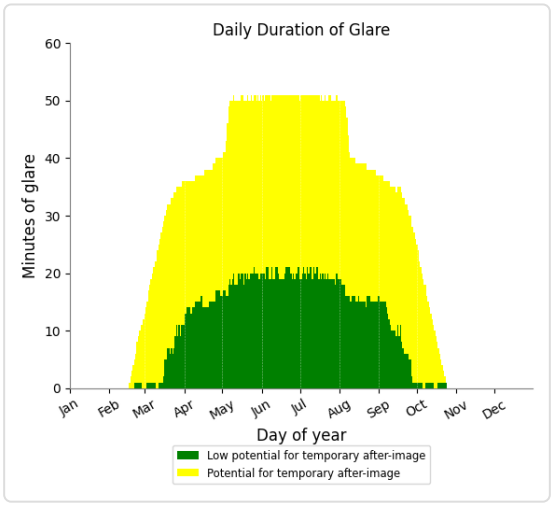


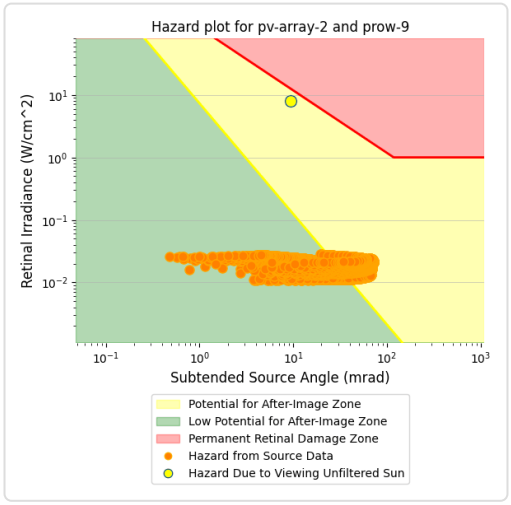
PV array 2 and Route: PRoW 9

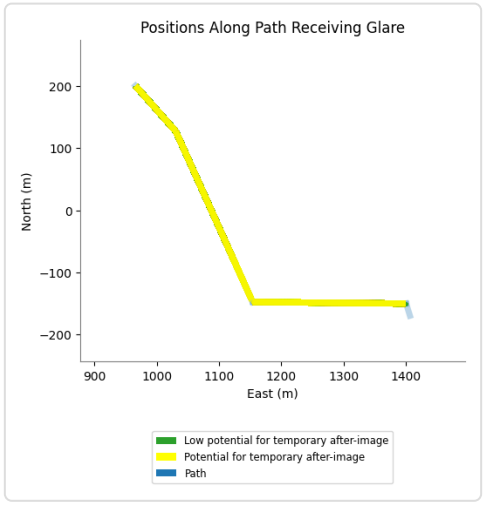
Yellow glare: 6,096 min.

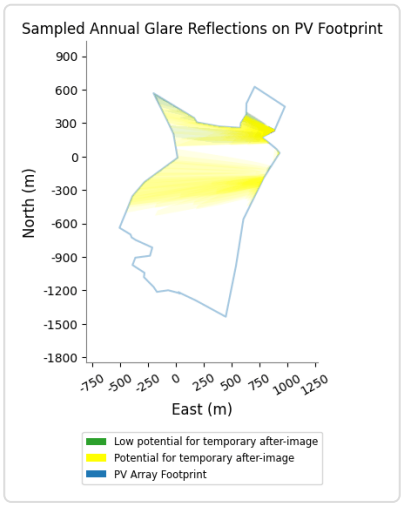
Green glare: 3,162 min.







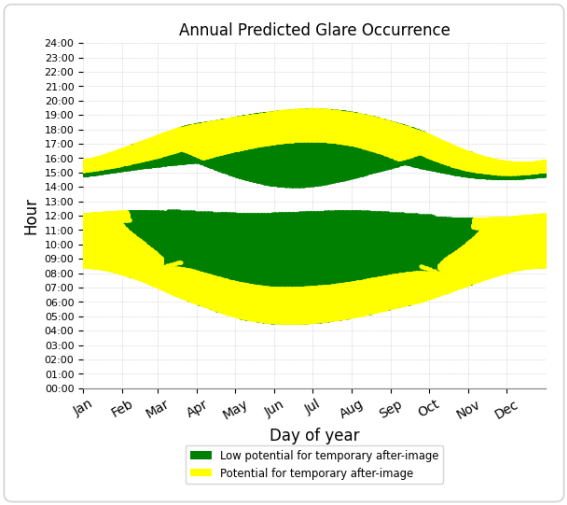


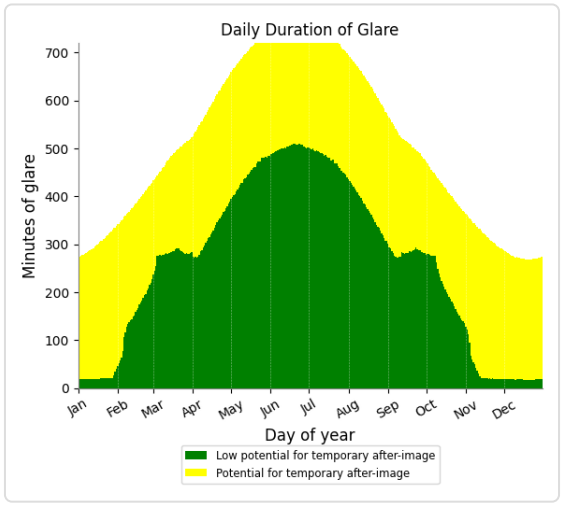


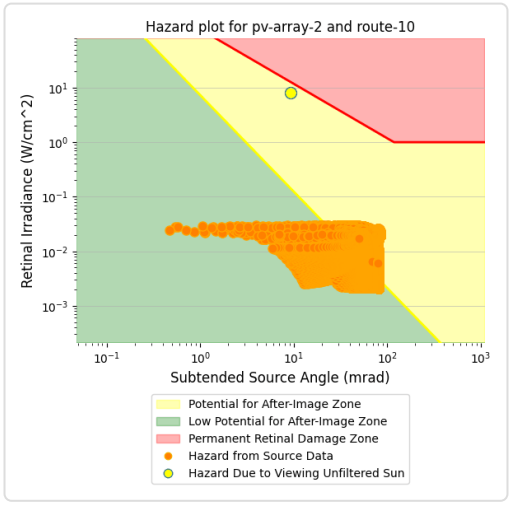
PV array 2 and Route: Route 10

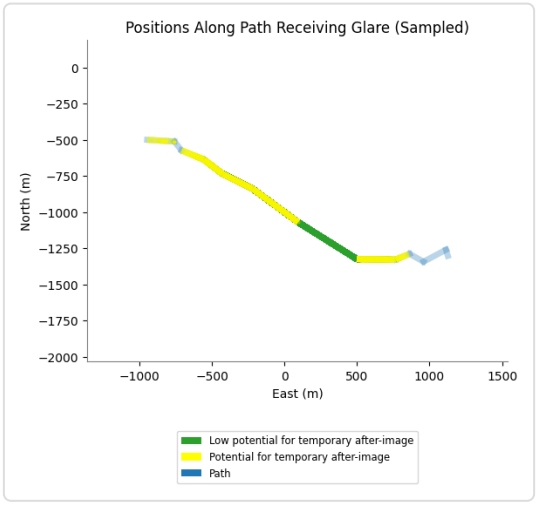
Yellow glare: 91,506 min.

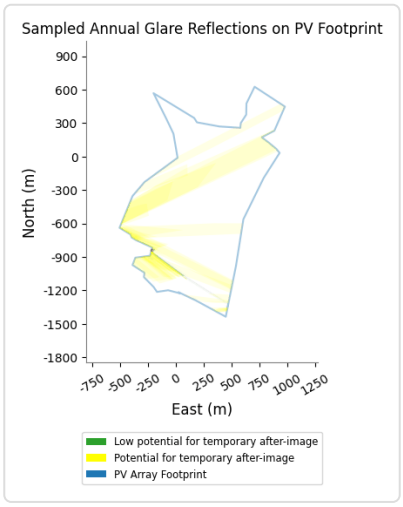
Green glare: 95,292 min.







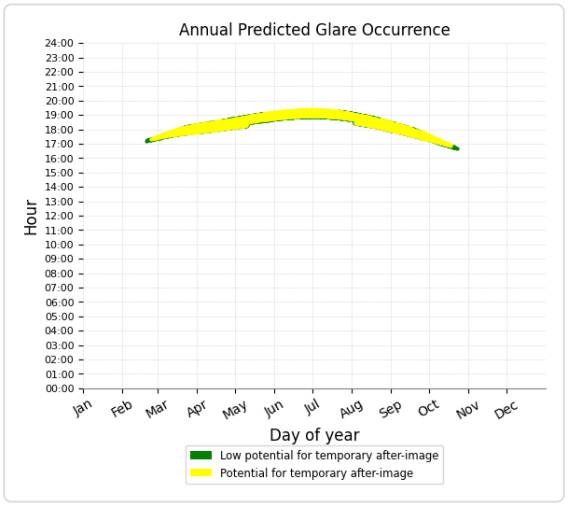


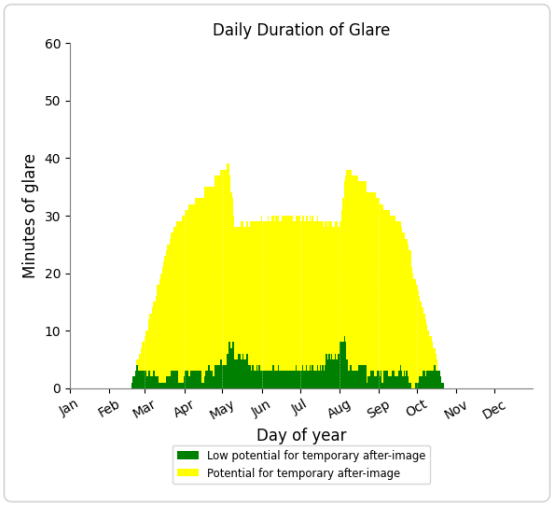


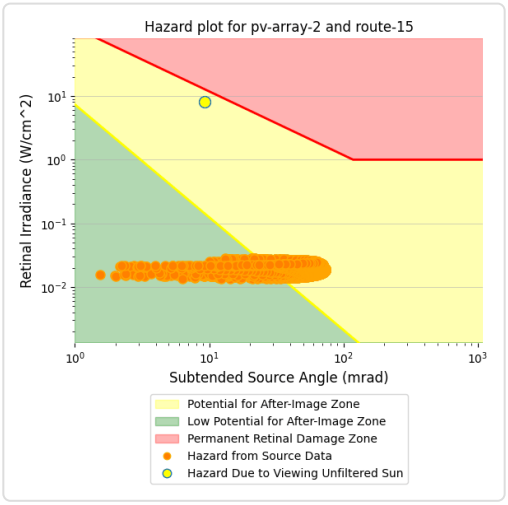
PV array 2 and Route: Route 15

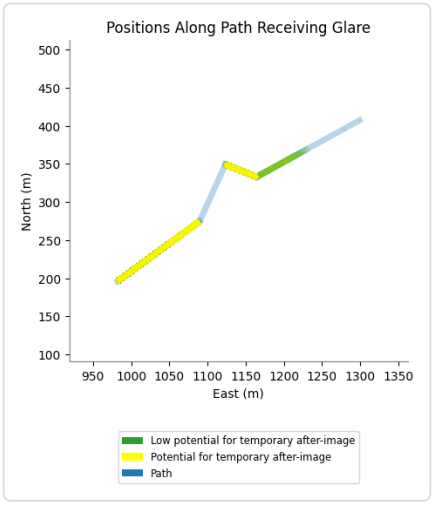
Yellow glare: 5,797 min.

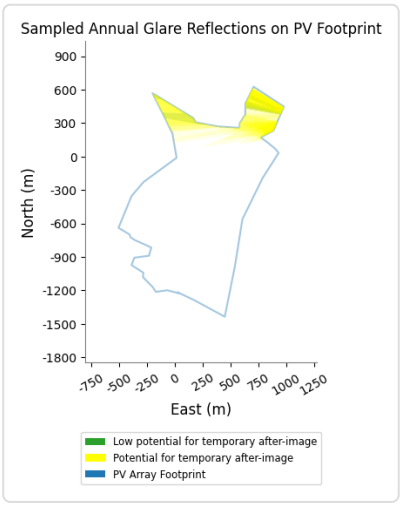
Green glare: 800 min.











PV: PV array 3 potential temporary after-image

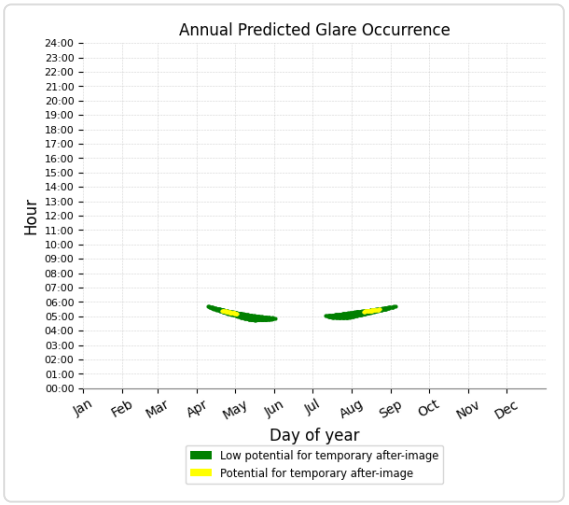
Receptor results ordered by category of glare

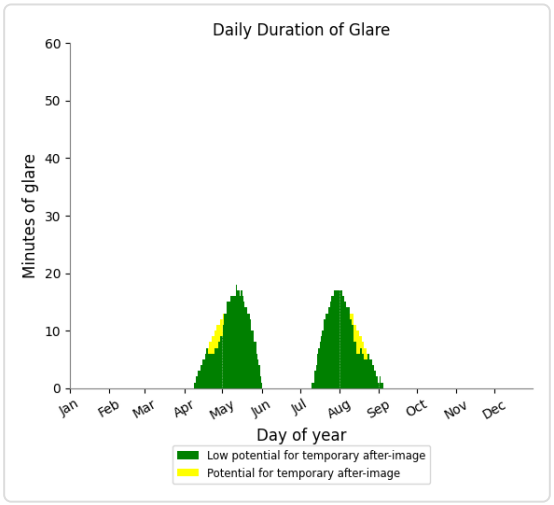
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	1,013	16.9	68	1.1
PRoW 14	1,359	22.6	2,885	48.1
PRoW 2	235	3.9	1,260	21.0
PRoW 8	892	14.9	3,374	56.2
PRoW 9	2,493	41.5	2,540	42.3
Route 15	362	6.0	366	6.1
PRoW 13	1,124	18.7	0	0.0
PRoW 3	771	12.8	0	0.0
PRoW 4	124	2.1	0	0.0
PRoW 5	56	0.9	0	0.0
PRoW 6	372	6.2	0	0.0
Route 10	1,572	26.2	0	0.0
PRoW 12	0	0.0	0	0.0
PRoW 11	0	0.0	0	0.0
PRoW 7	0	0.0	0	0.0

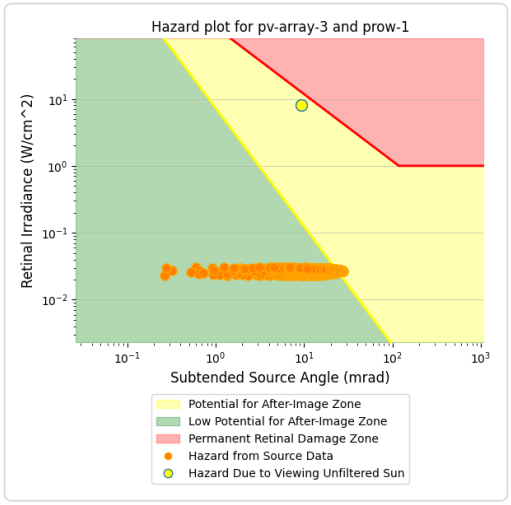
PV array 3 and Route: PRoW 1

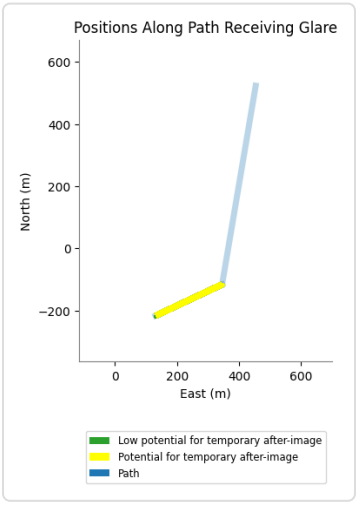
Yellow glare: 68 min.

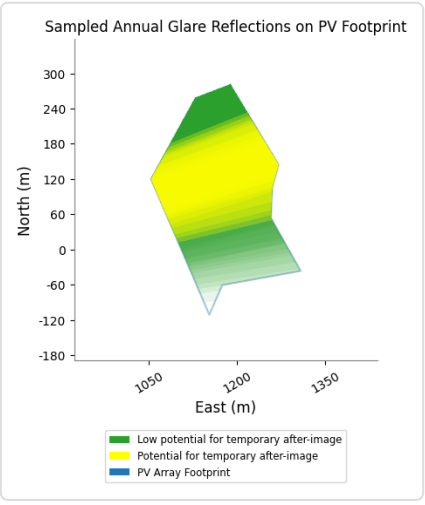
Green glare: 1,013 min.







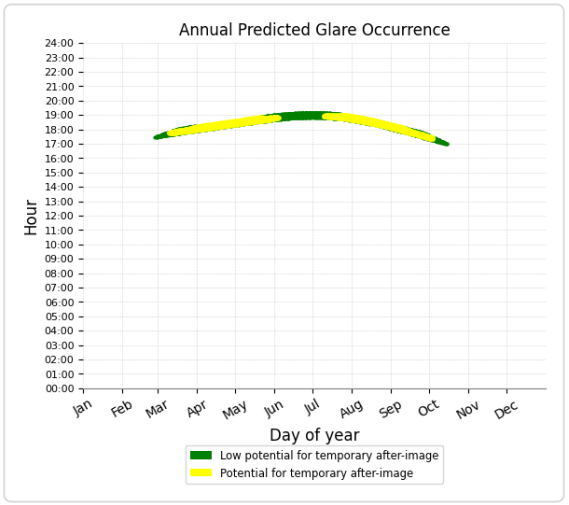


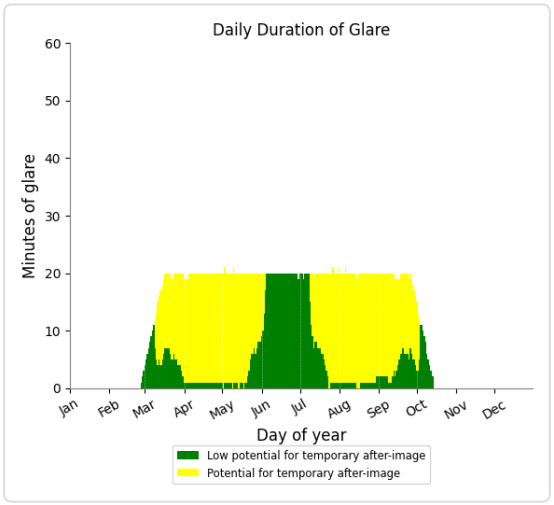


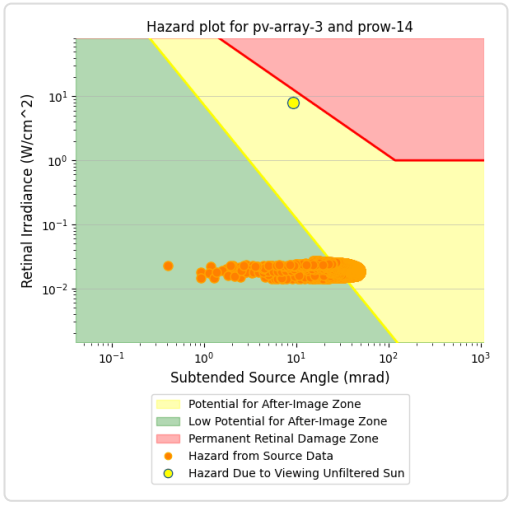
PV array 3 and Route: PRoW 14

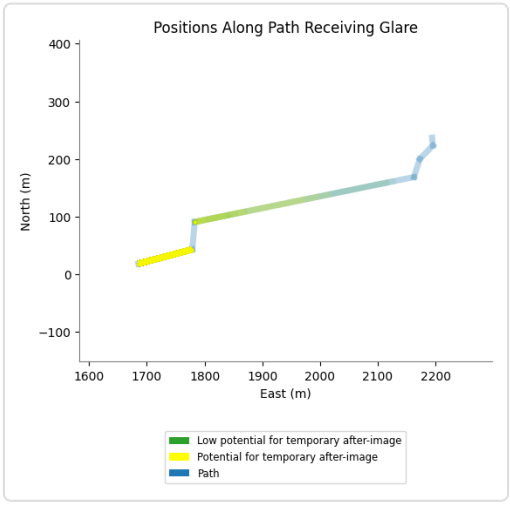
Yellow glare: 2,885 min.

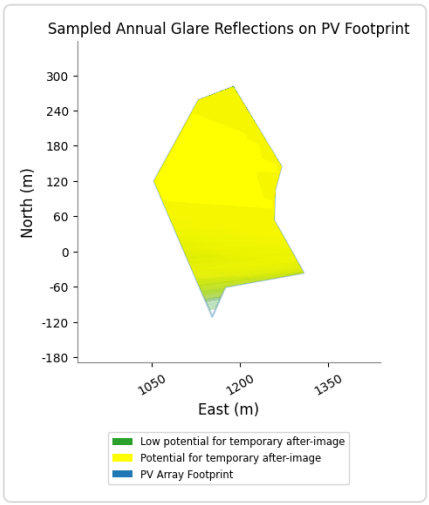
Green glare: 1,359 min.







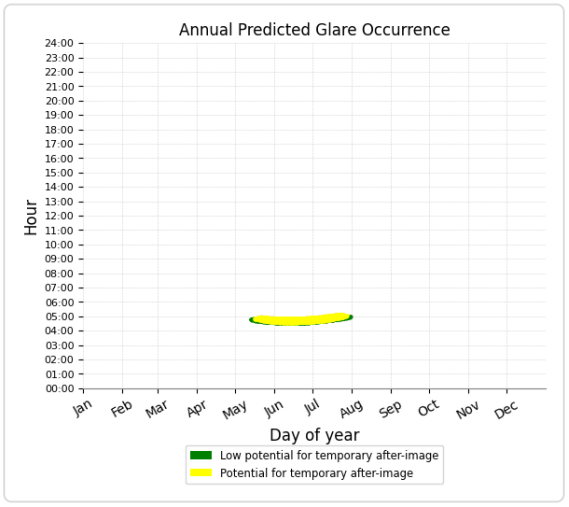


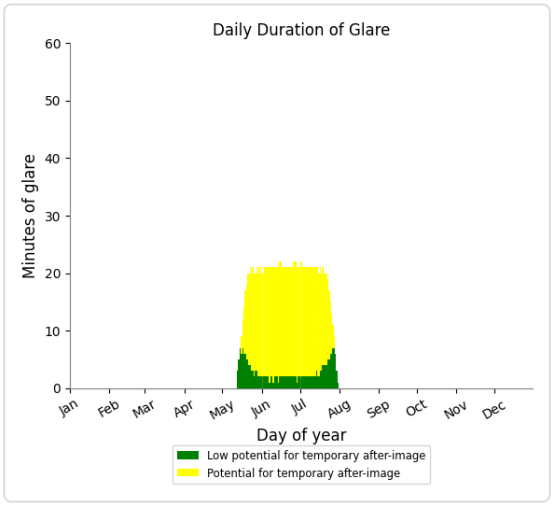


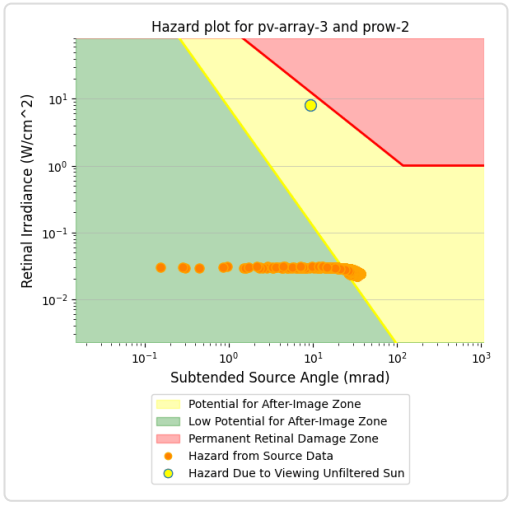
PV array 3 and Route: PRoW 2

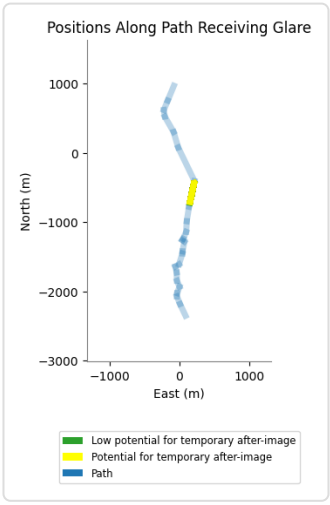
Yellow glare: 1,260 min.

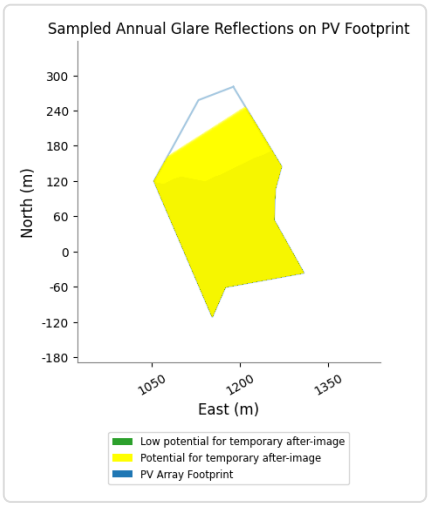
Green glare: 235 min.







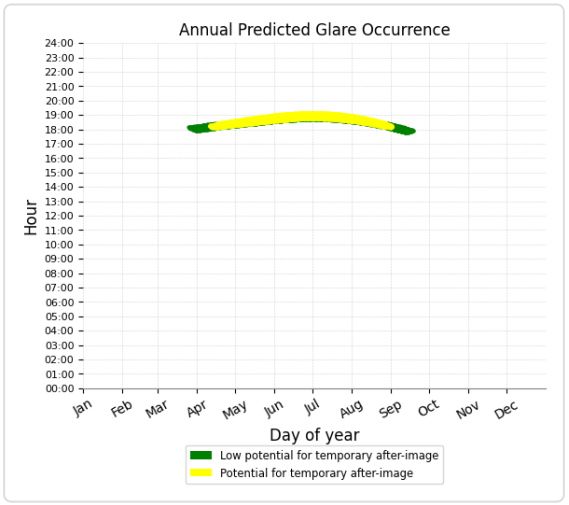


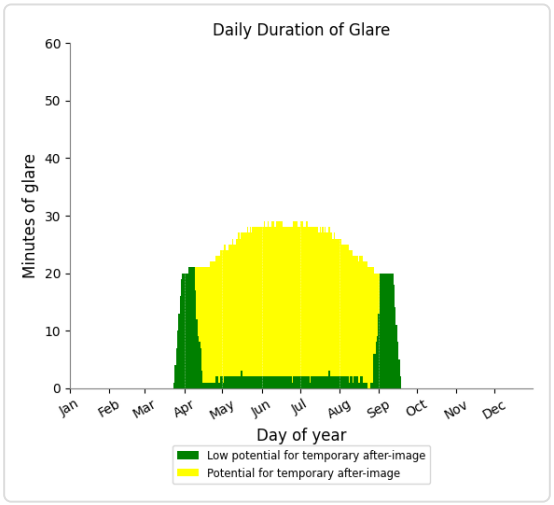


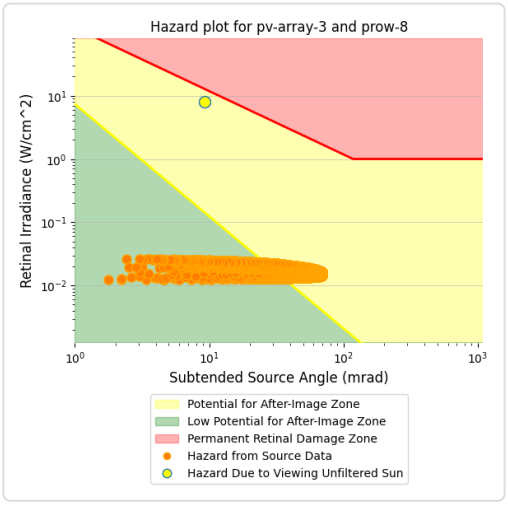
PV array 3 and Route: PRoW 8

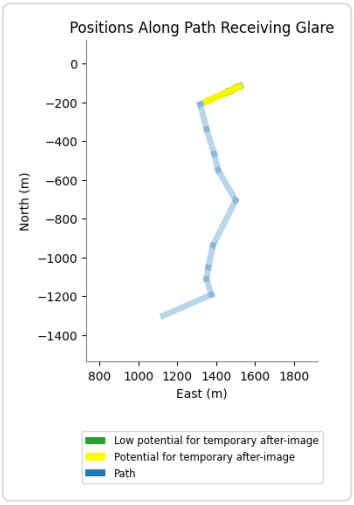
Yellow glare: 3,374 min.

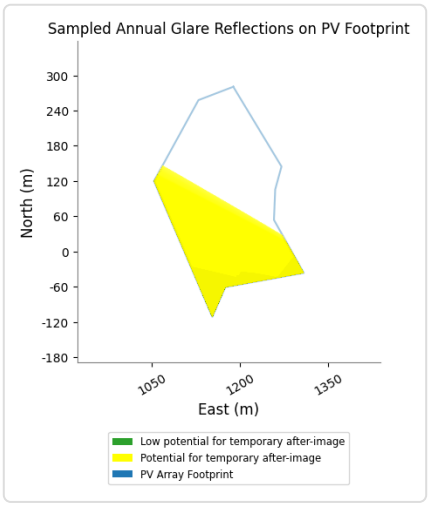
Green glare: 892 min.







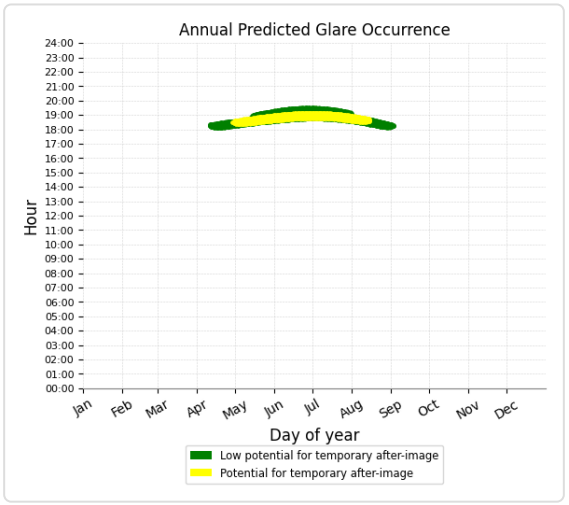


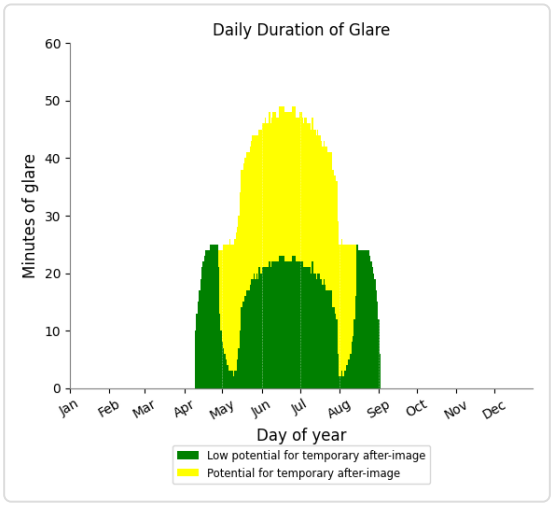


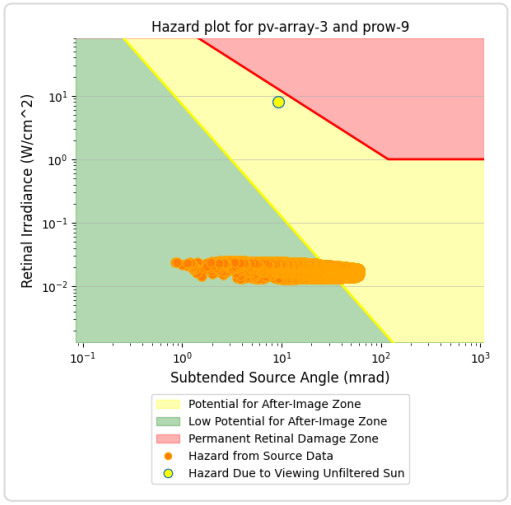
PV array 3 and Route: PRoW 9

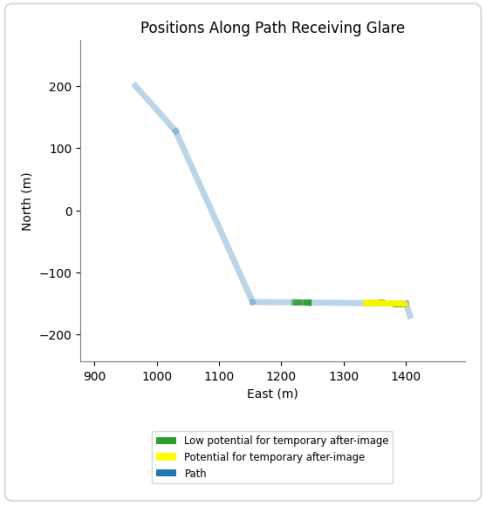
Yellow glare: 2,540 min.

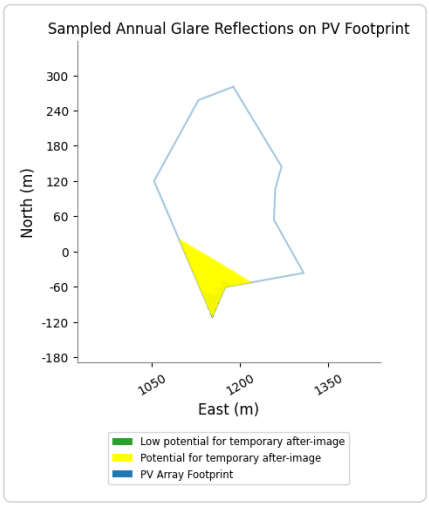
Green glare: 2,493 min.







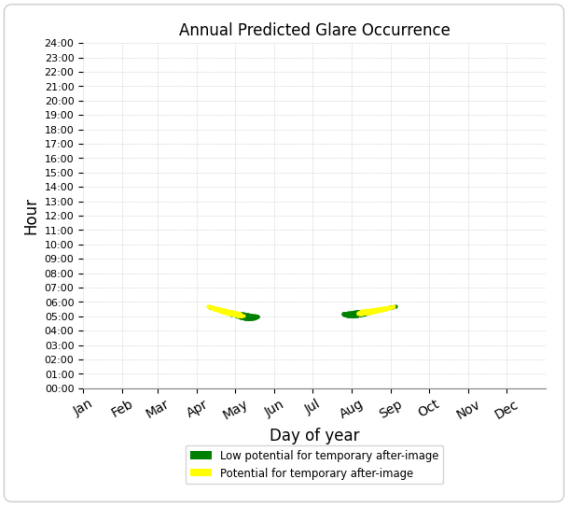


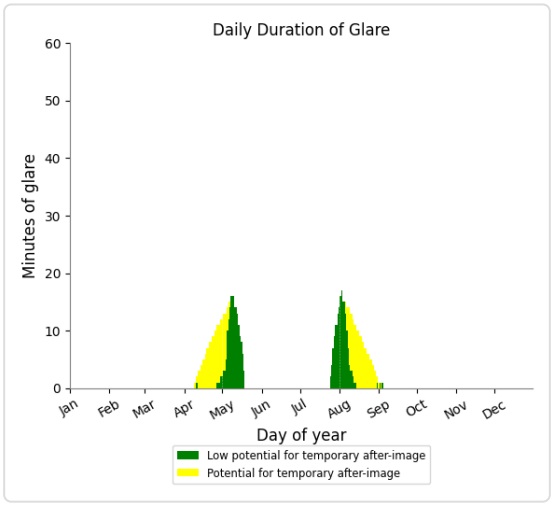


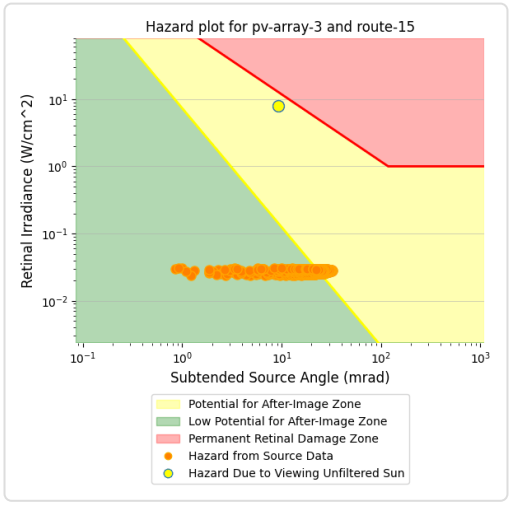
PV array 3 and Route: Route 15

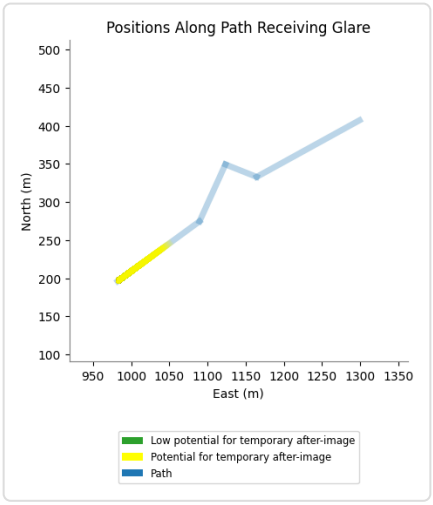
Yellow glare: 366 min.

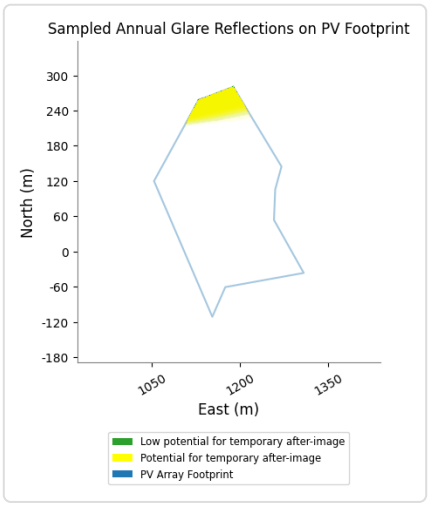
Green glare: 362 min.







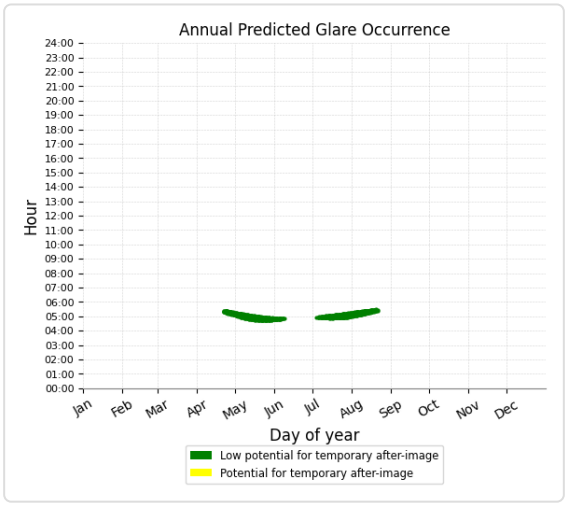


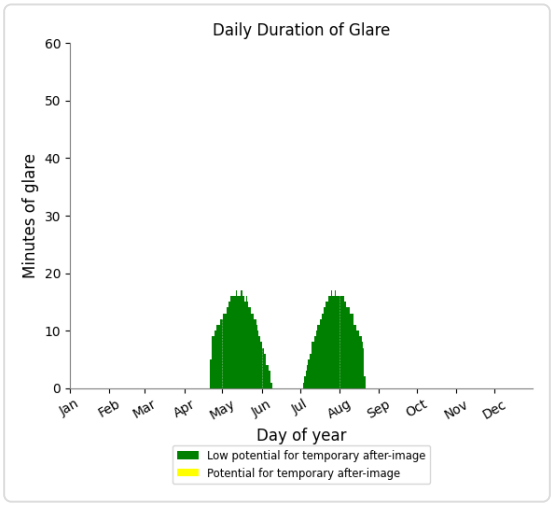


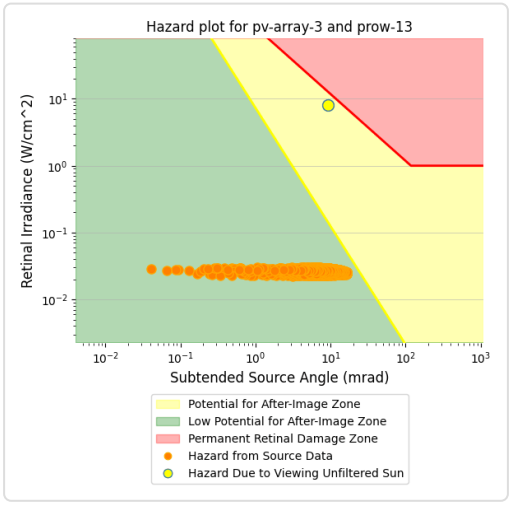
PV array 3 and Route: PRoW 13

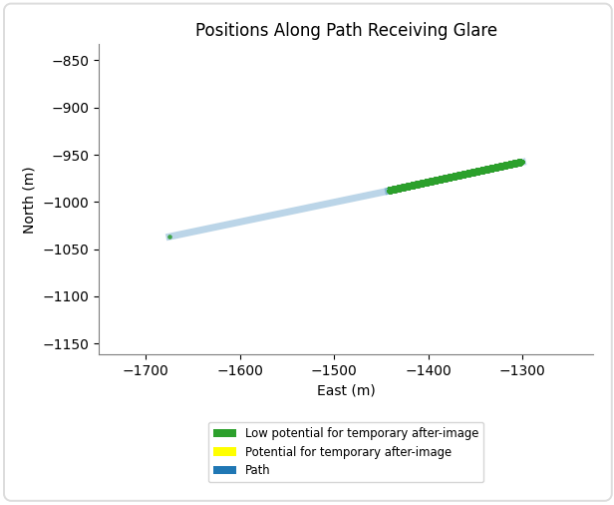
Yellow glare: none

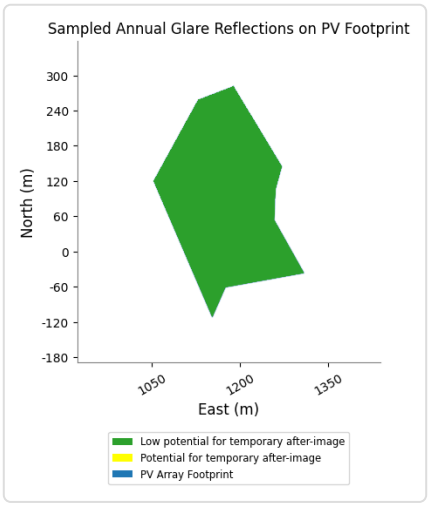
Green glare: 1,124 min.







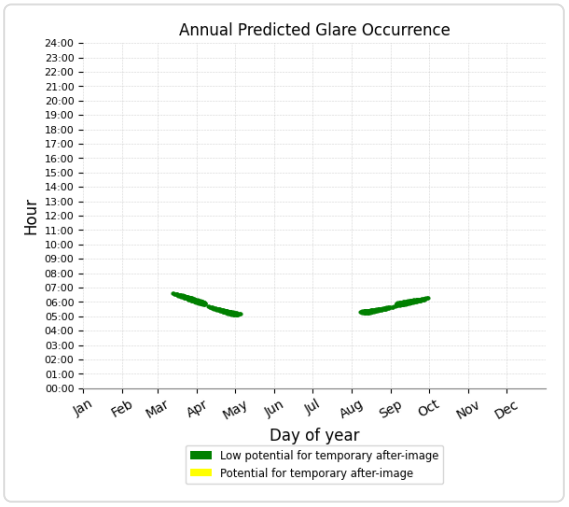


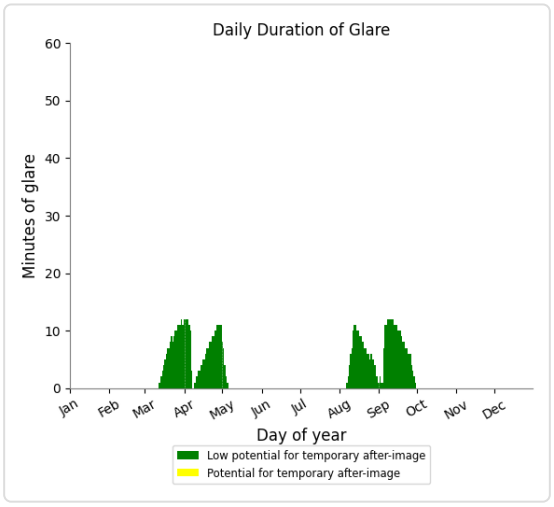


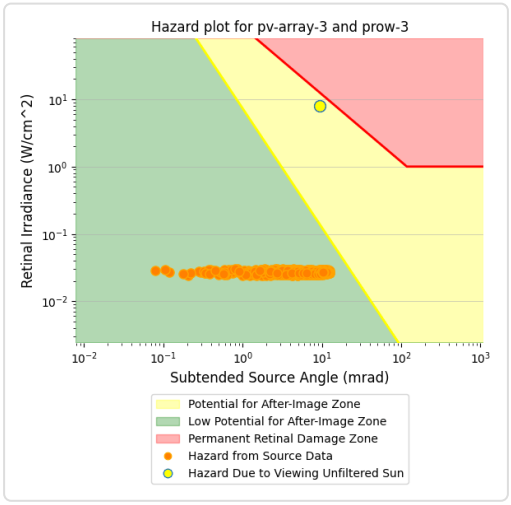
PV array 3 and Route: PRoW 3

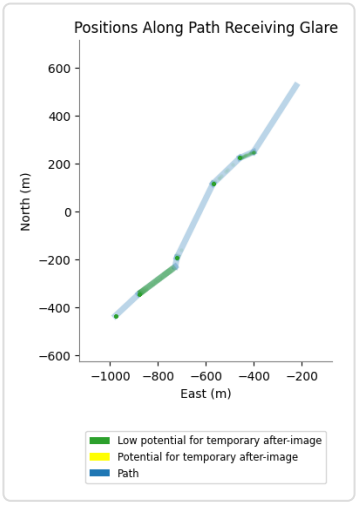
Yellow glare: none

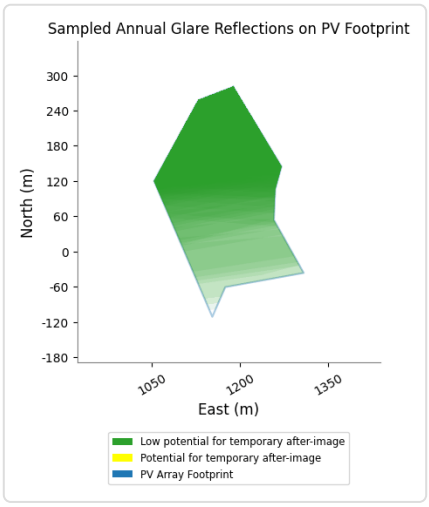
Green glare: 771 min.







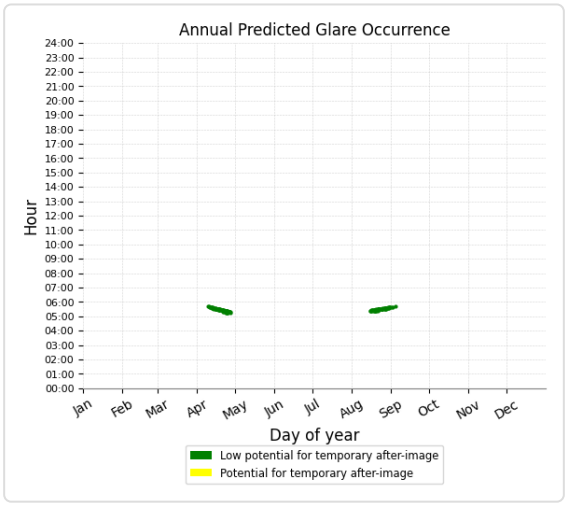


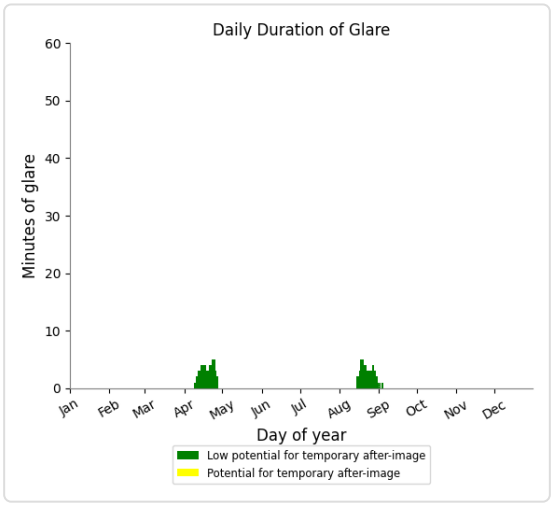


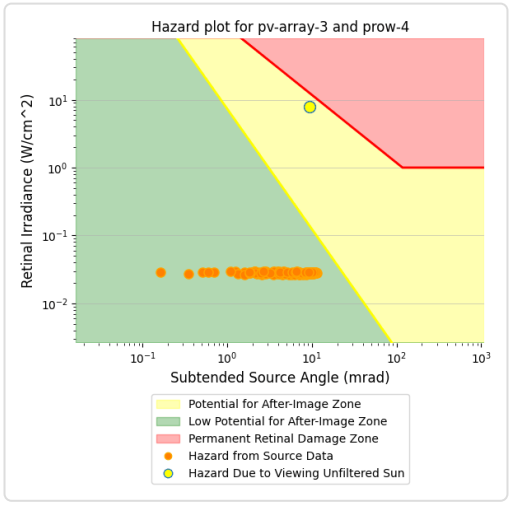
PV array 3 and Route: PRoW 4

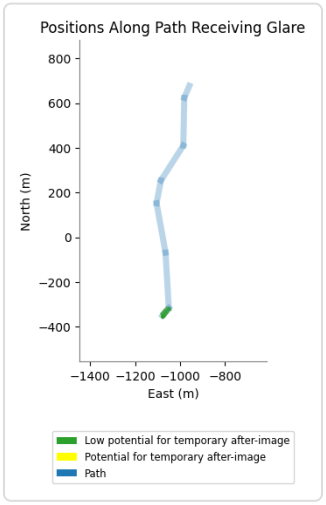
Yellow glare: none

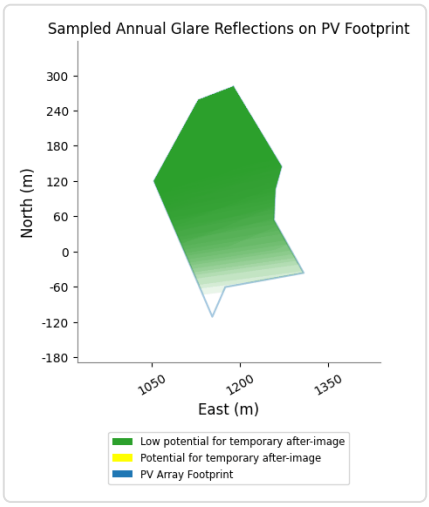
Green glare: 124 min.







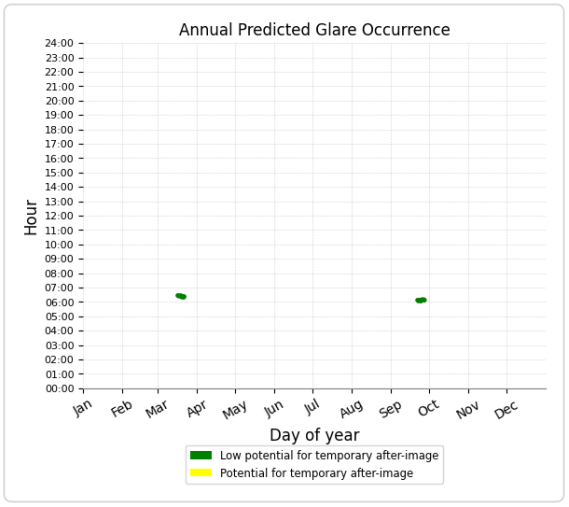


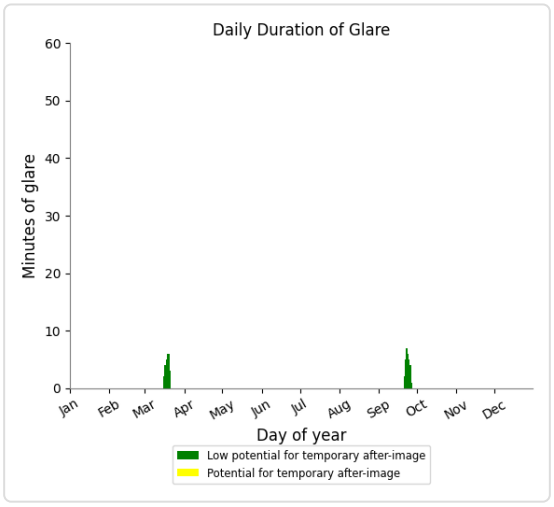


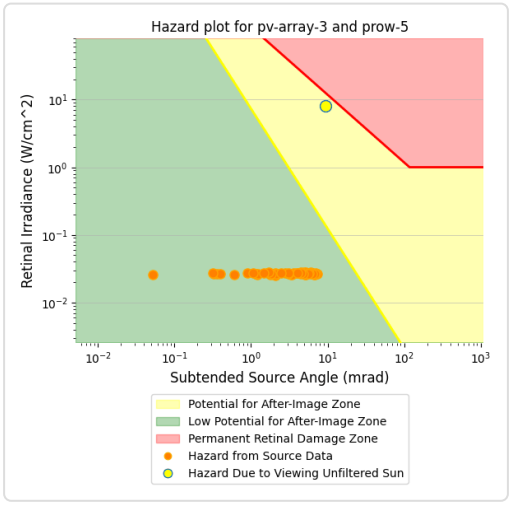
PV array 3 and Route: PRoW 5

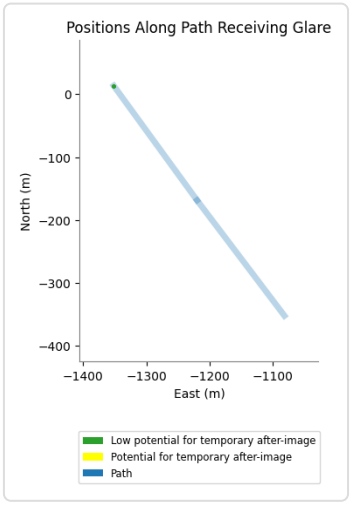
Yellow glare: none

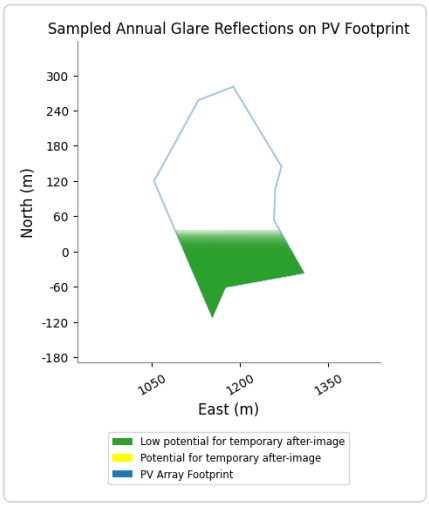
Green glare: 56 min.







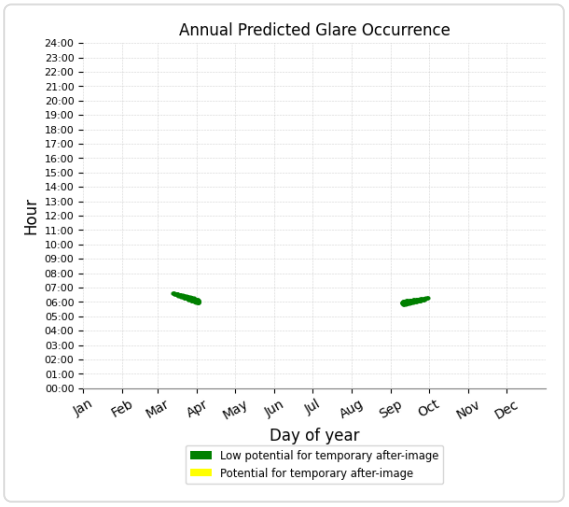


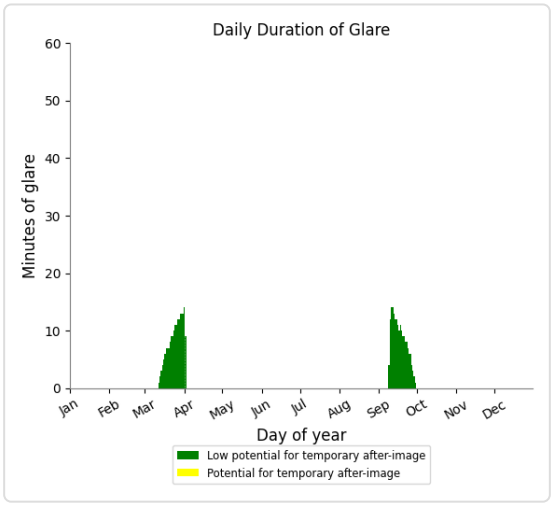


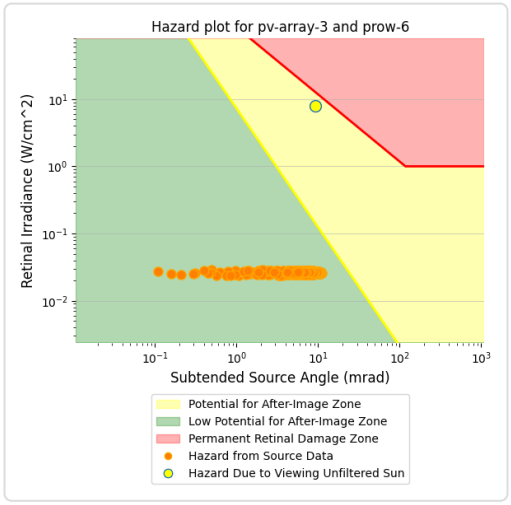
PV array 3 and Route: PRoW 6

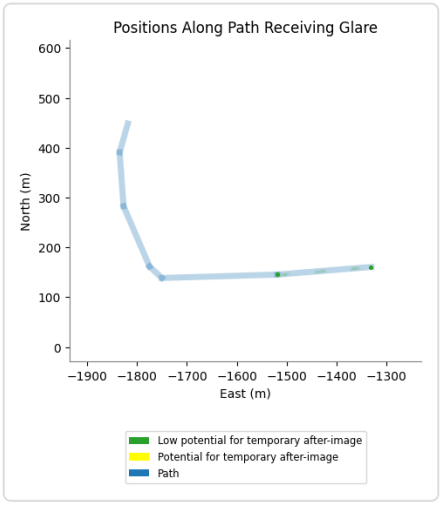
Yellow glare: none

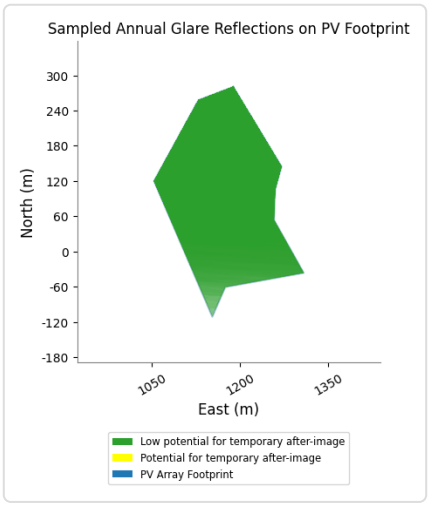
Green glare: 372 min.







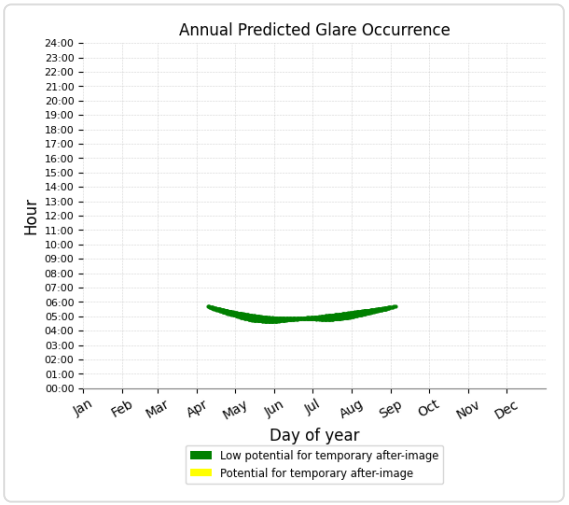


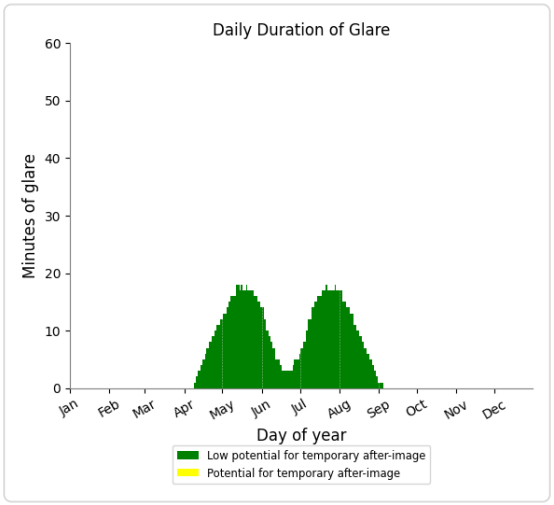


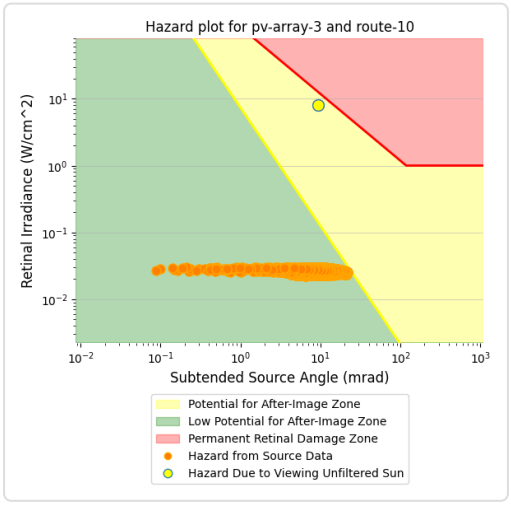
PV array 3 and Route: Route 10

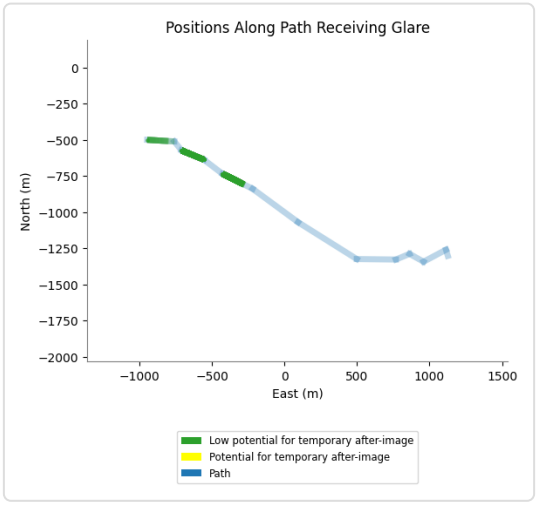
Yellow glare: none

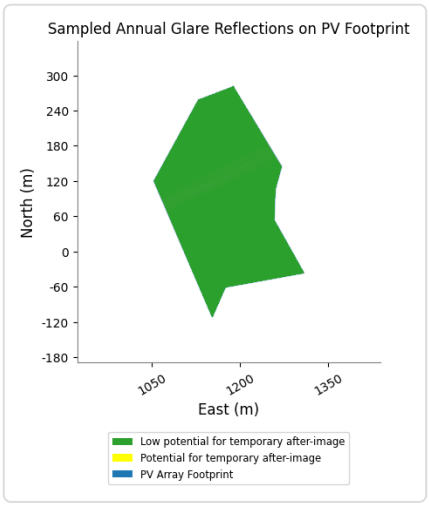
Green glare: 1,572 min.











PV array 3 and Route: PRoW 12

No glare found

PV array 3 and Route: PRoW 11

No glare found

PV array 3 and Route: PRoW 7

No glare found

PV: PV array 4 potential temporary after-image

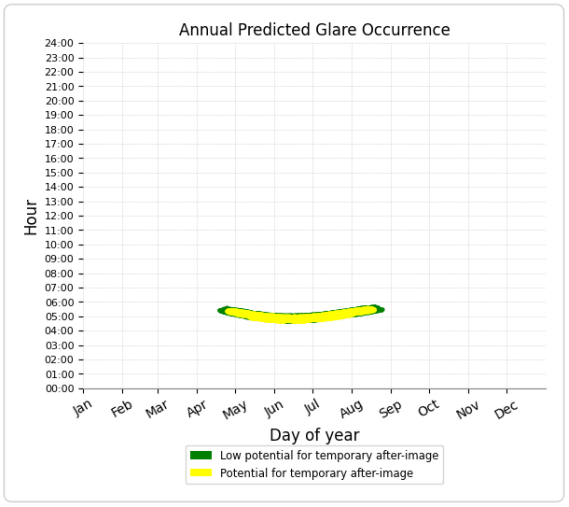
Receptor results ordered by category of glare

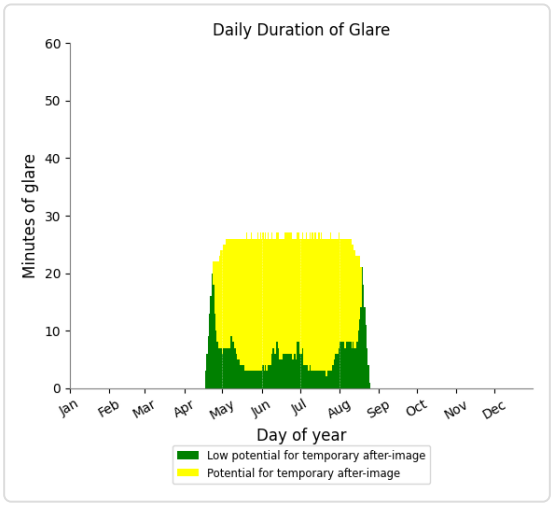
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2	796	13.3	2,366	39.4
PRoW 7	515	8.6	1,437	23.9
PRoW 8	1,089	18.1	4,634	77.2
PRoW 9	288	4.8	534	8.9
Route 10	1,148	19.1	2,195	36.6
PRoW 1	198	3.3	0	0.0
PRoW 11	470	7.8	0	0.0
PRoW 13	1,731	28.9	0	0.0
PRoW 3	403	6.7	0	0.0
PRoW 4	252	4.2	0	0.0
PRoW 5	132	2.2	0	0.0
PRoW 12	0	0.0	0	0.0
PRoW 14	0	0.0	0	0.0
PRoW 6	0	0.0	0	0.0
Route 15	0	0.0	0	0.0

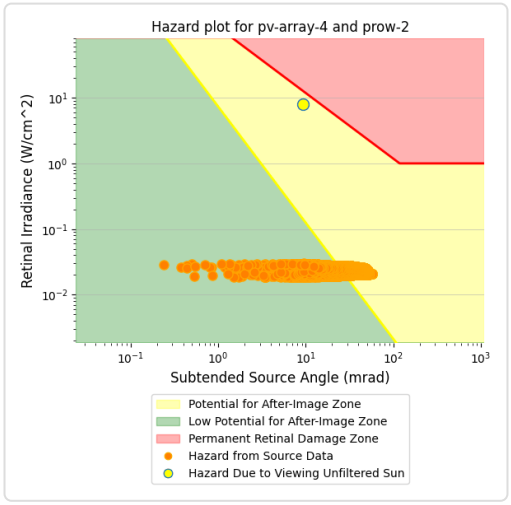
PV array 4 and Route: PRoW 2

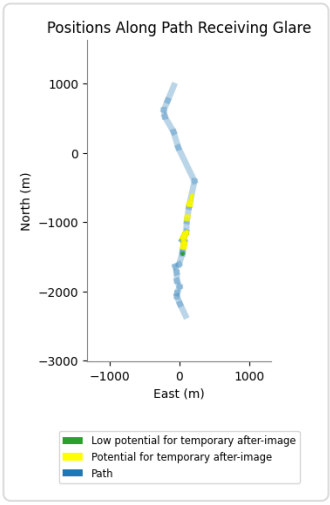
Yellow glare: 2,366 min.

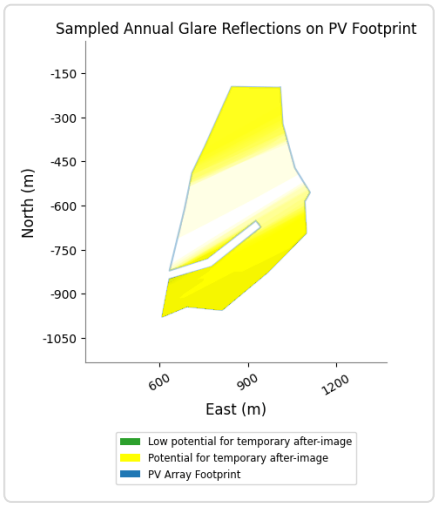
Green glare: 796 min.







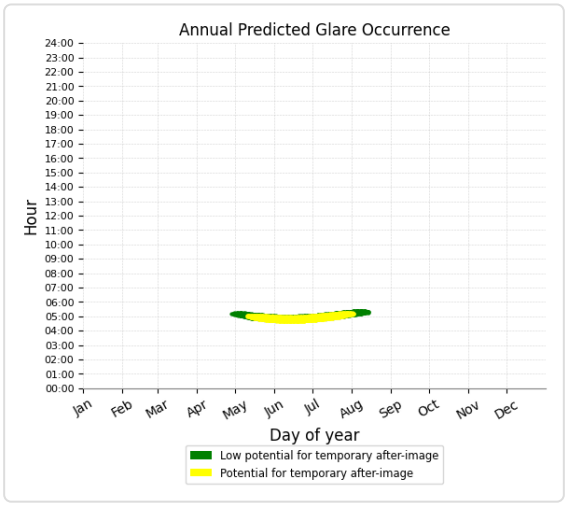


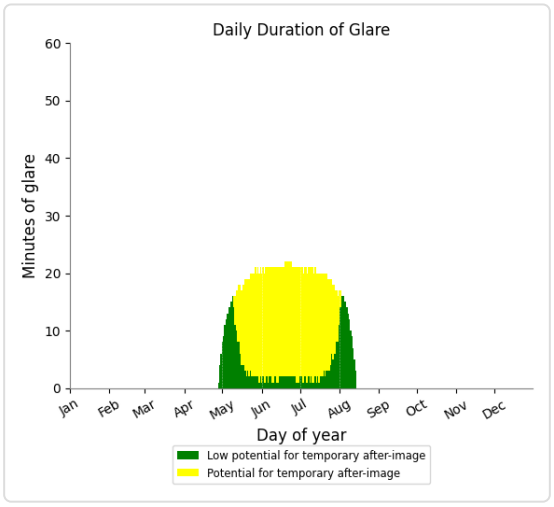


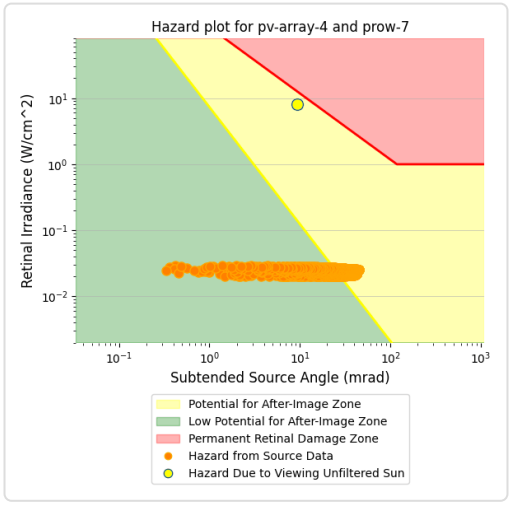
PV array 4 and Route: PRoW 7

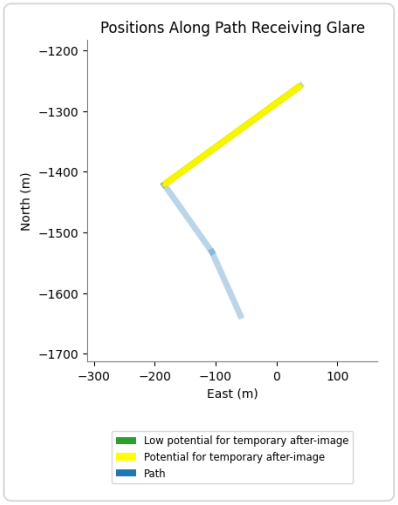
Yellow glare: 1,437 min.

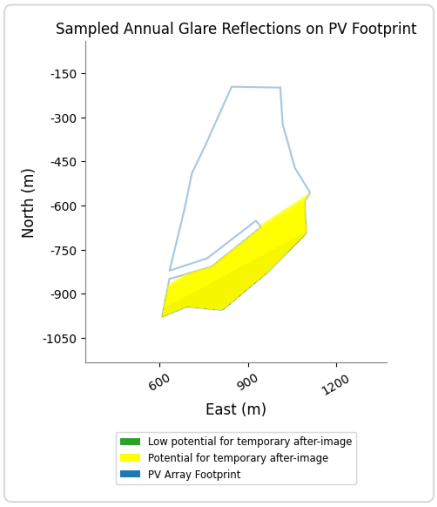
Green glare: 515 min.







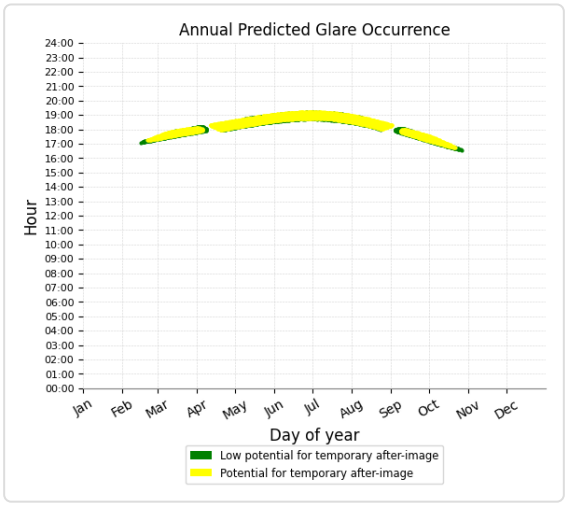


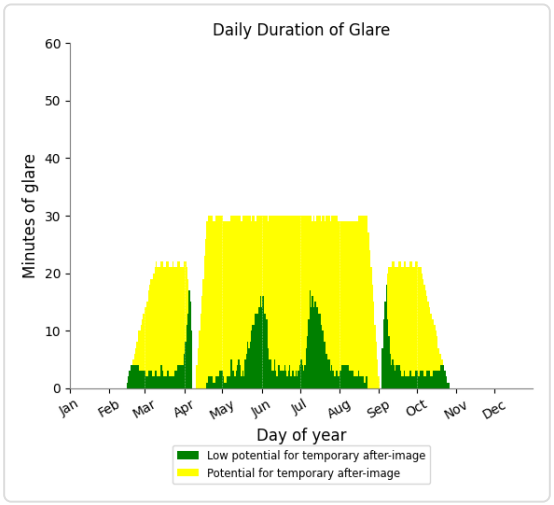


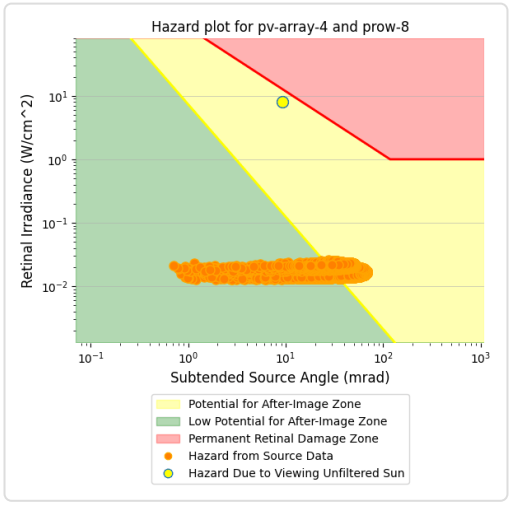
PV array 4 and Route: PRoW 8

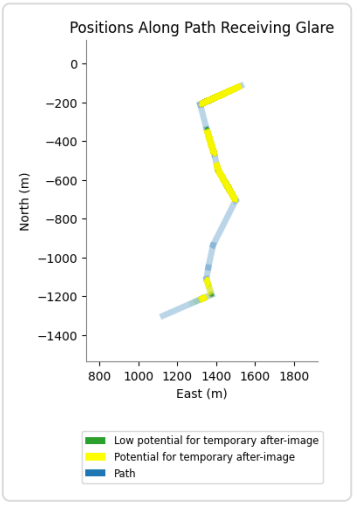
Yellow glare: 4,634 min.

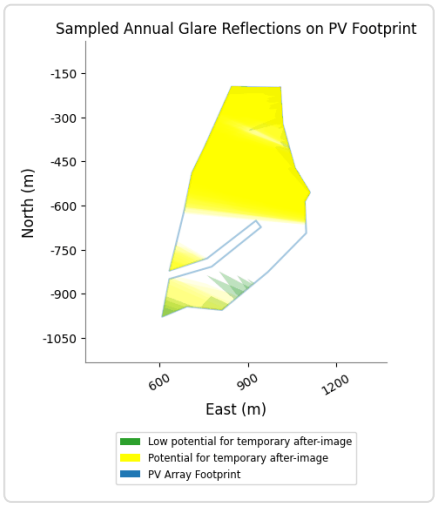
Green glare: 1,089 min.







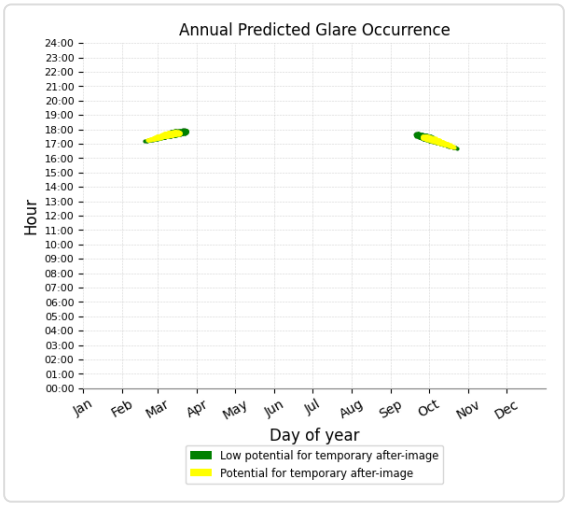


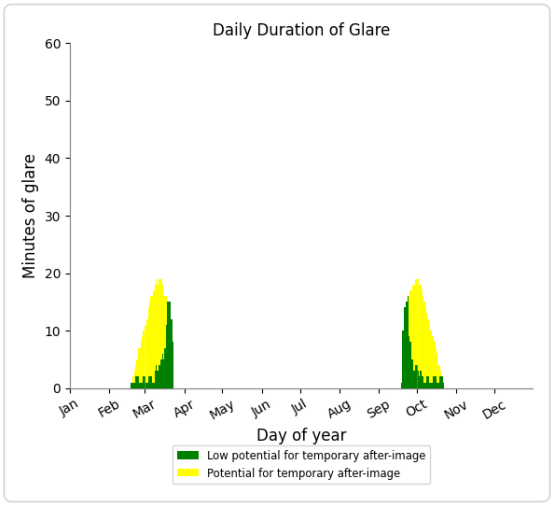


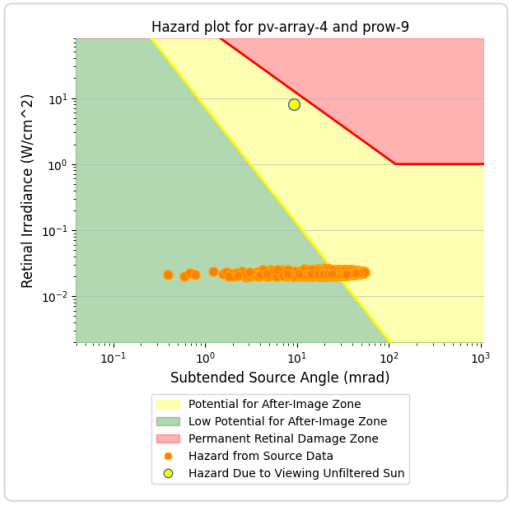
PV array 4 and Route: PRoW 9

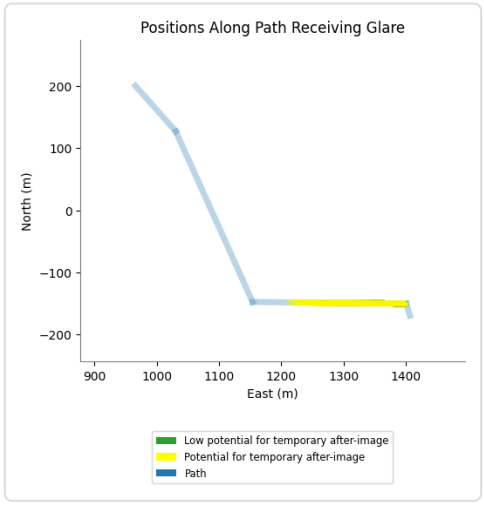
Yellow glare: 534 min.

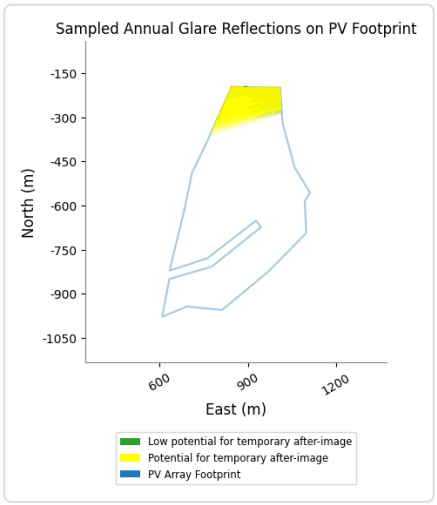
Green glare: 288 min.







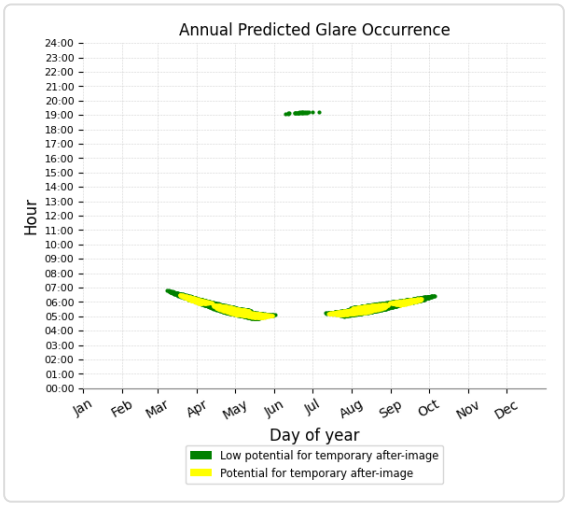


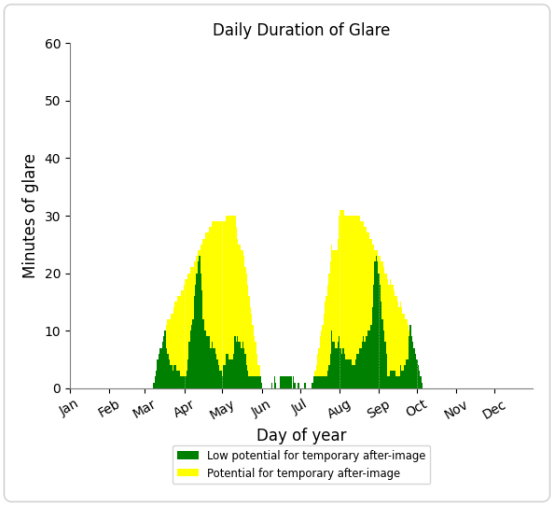


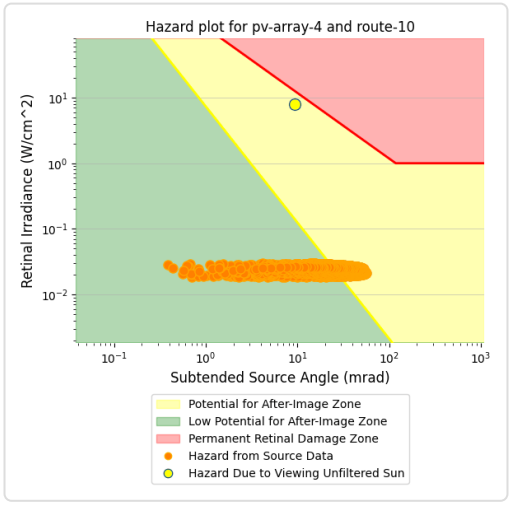
PV array 4 and Route: Route 10

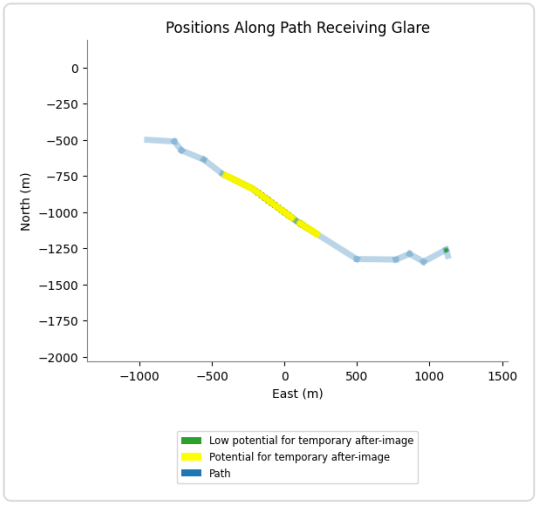
Yellow glare: 2,195 min.

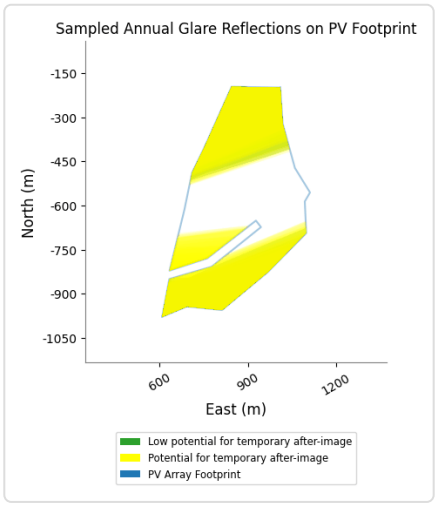
Green glare: 1,148 min.







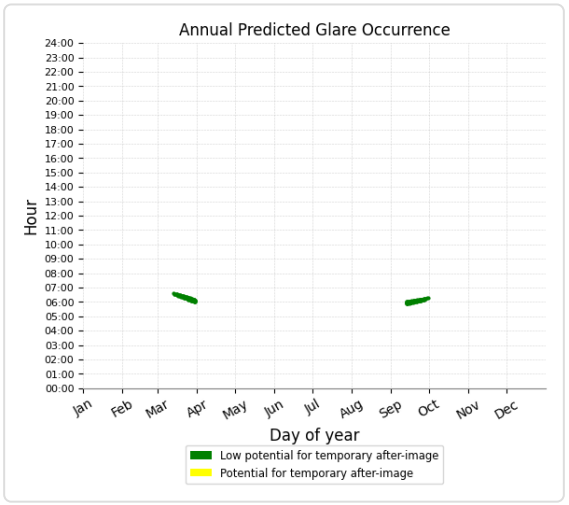


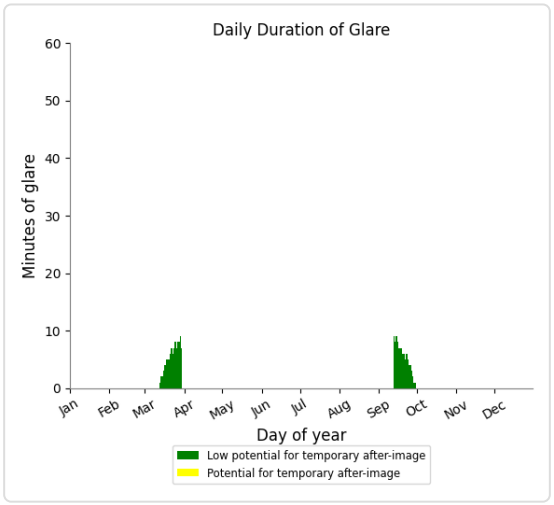


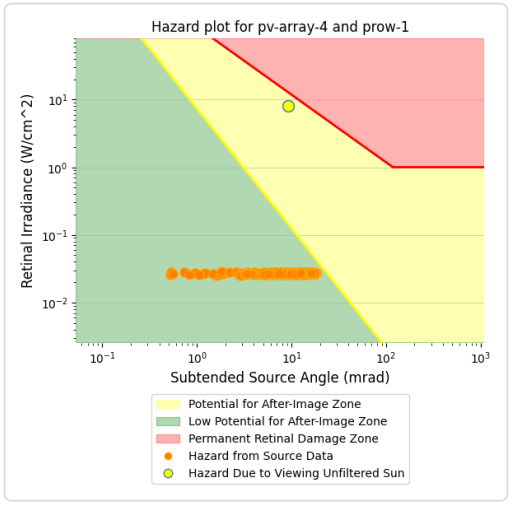
PV array 4 and Route: PRoW 1

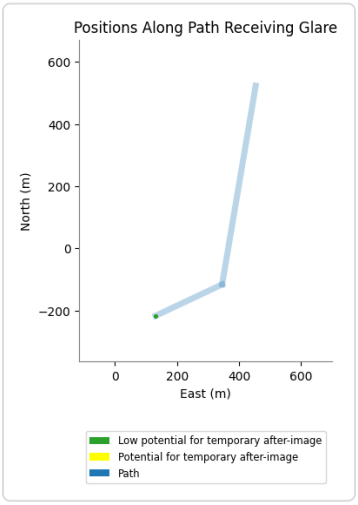
Yellow glare: none

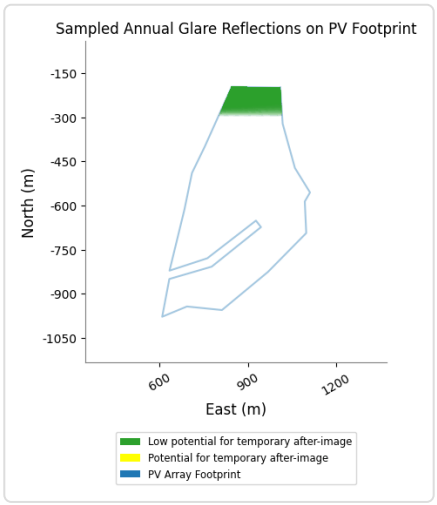
Green glare: 198 min.







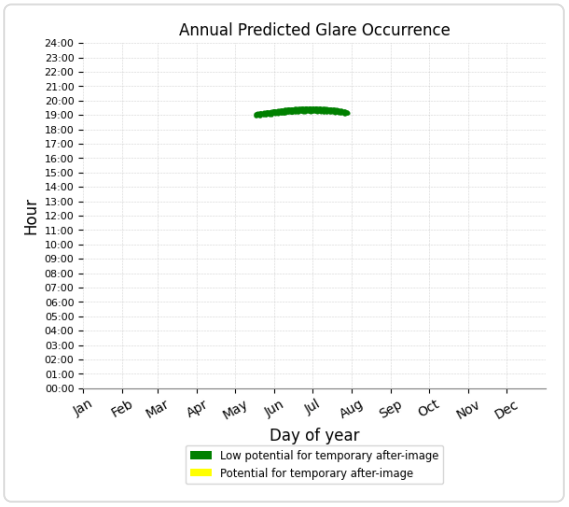


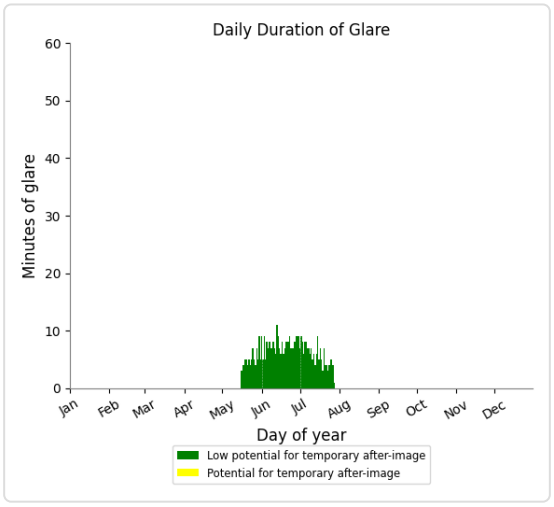


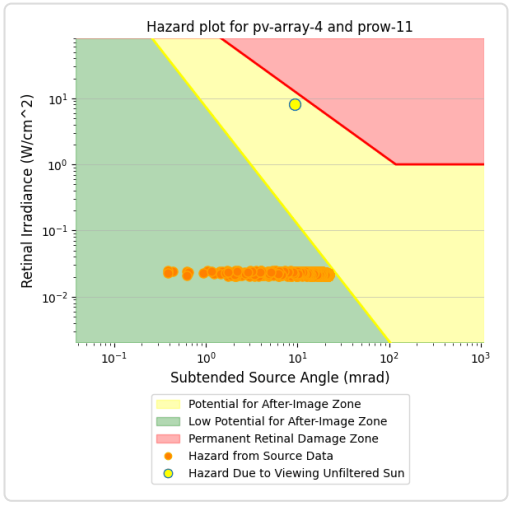
PV array 4 and Route: PRoW 11

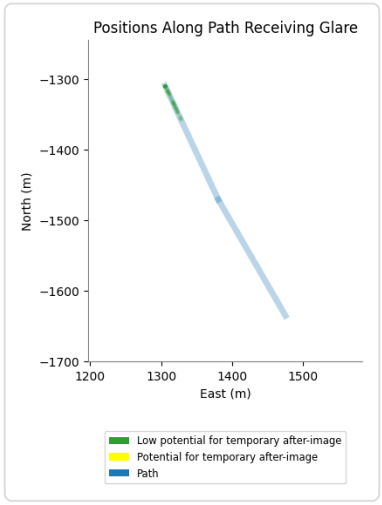
Yellow glare: none

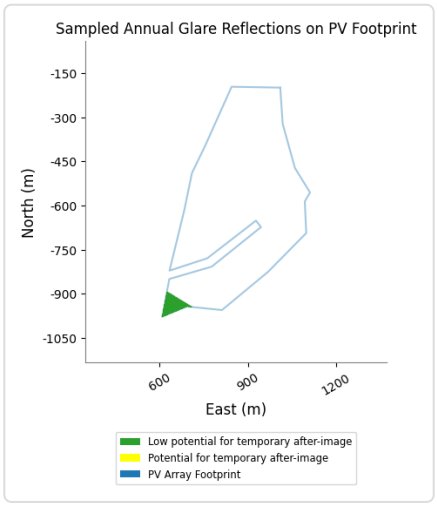
Green glare: 470 min.







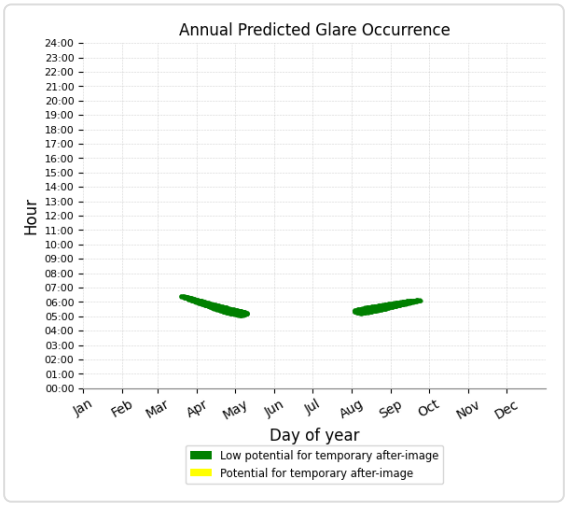


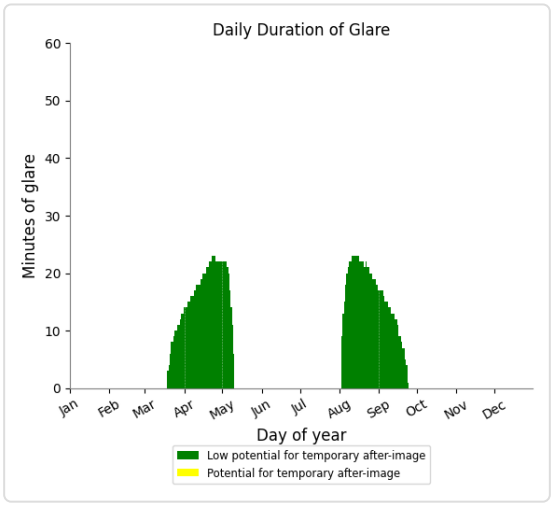


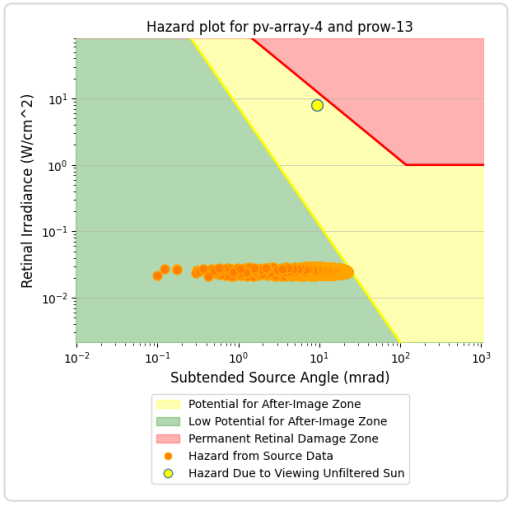
PV array 4 and Route: PRoW 13

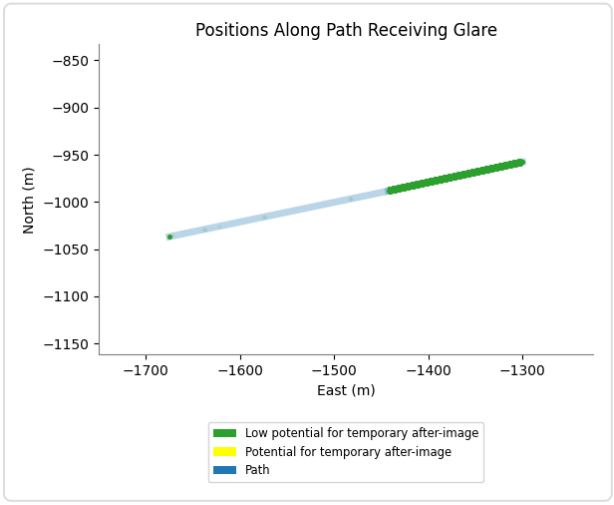
Yellow glare: none

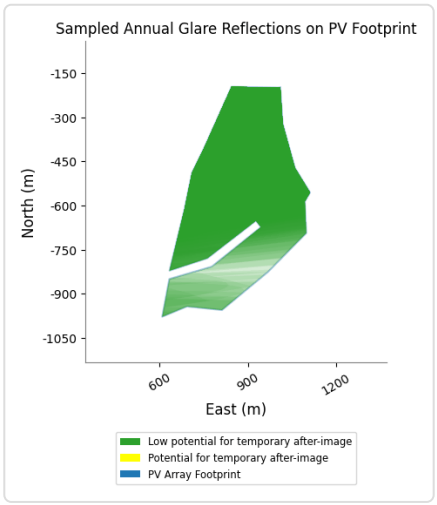
Green glare: 1,731 min.







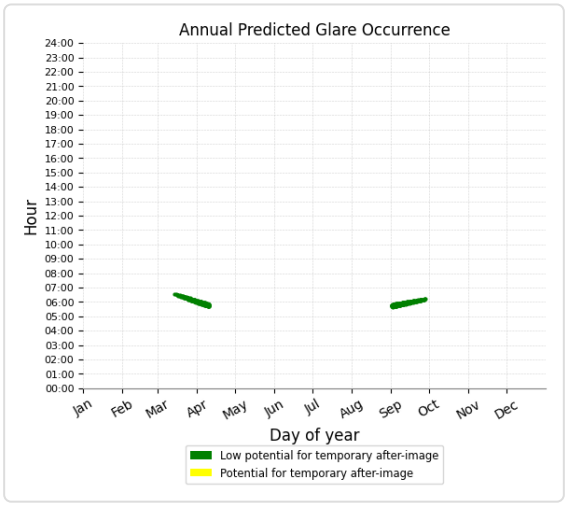


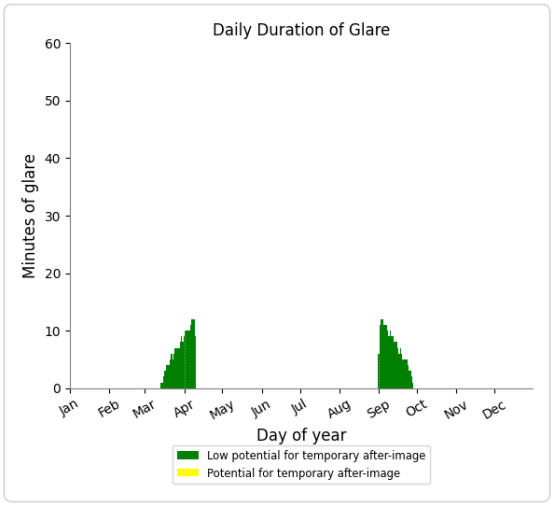


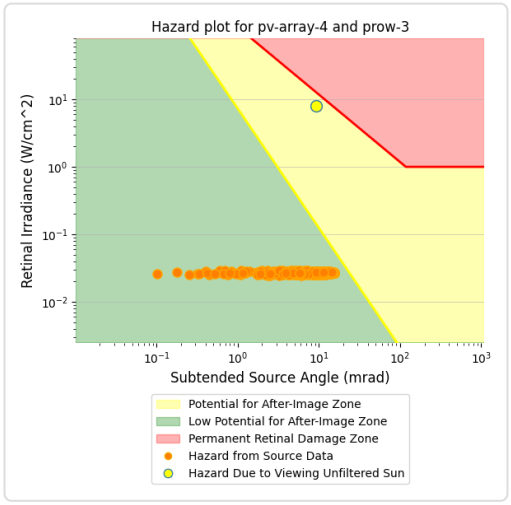
PV array 4 and Route: PRoW 3

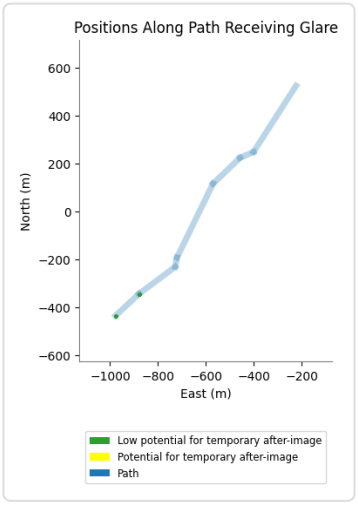
Yellow glare: none

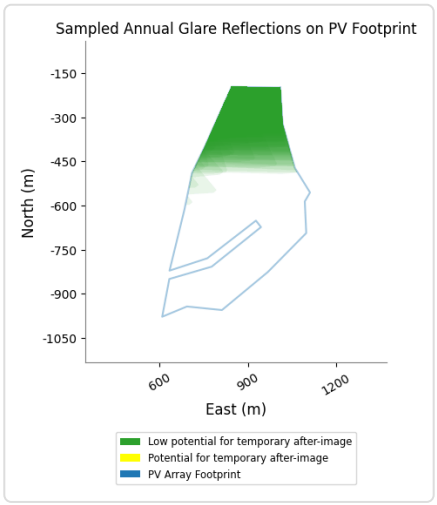
Green glare: 403 min.







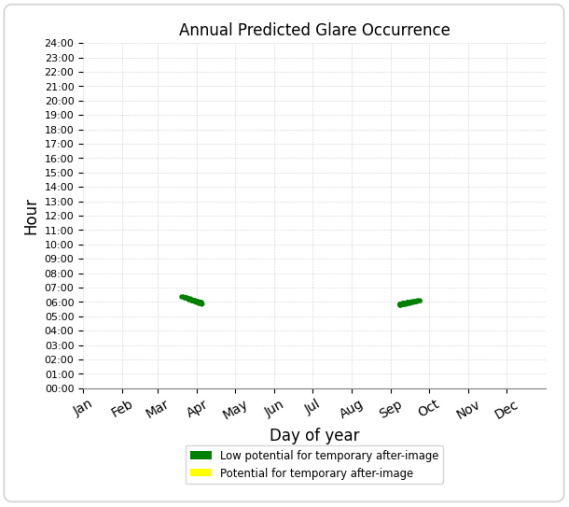


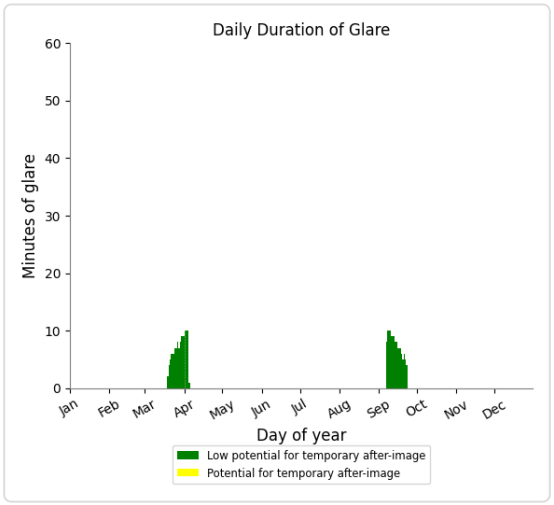


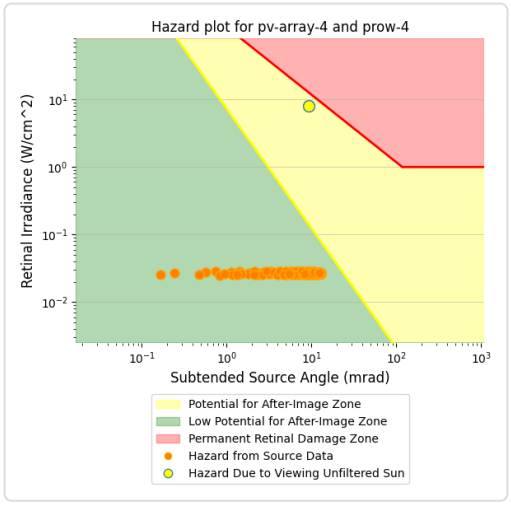
PV array 4 and Route: PRoW 4

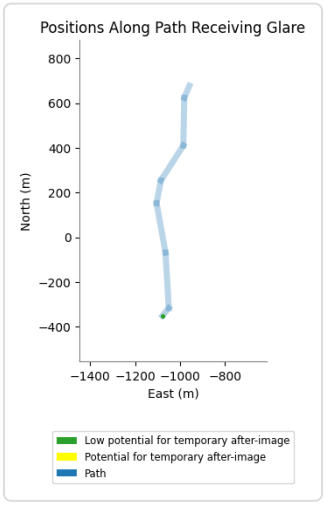
Yellow glare: none

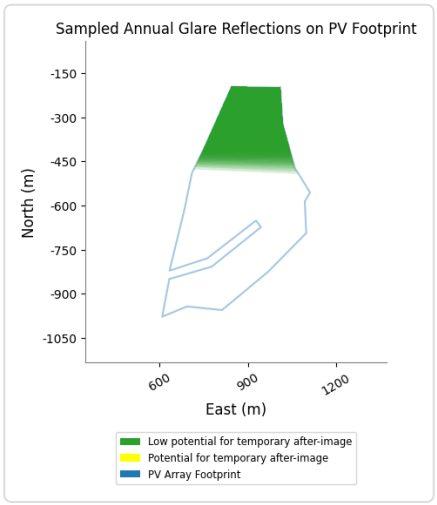
Green glare: 252 min.







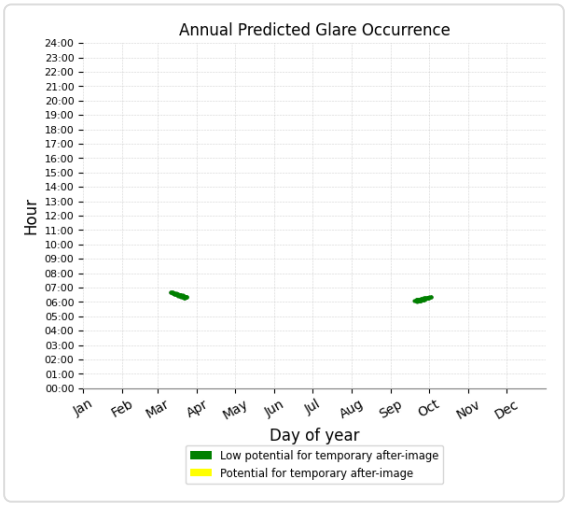


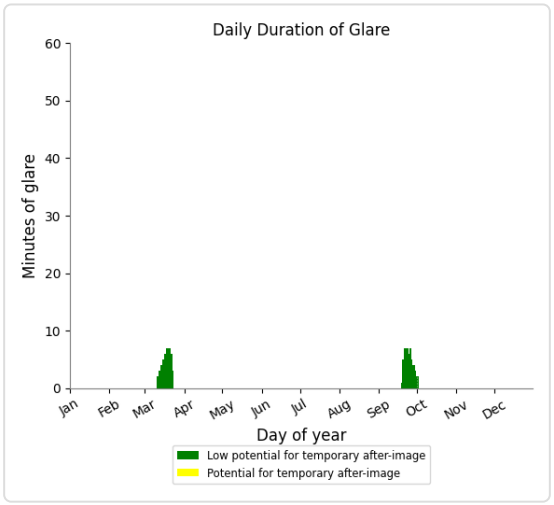


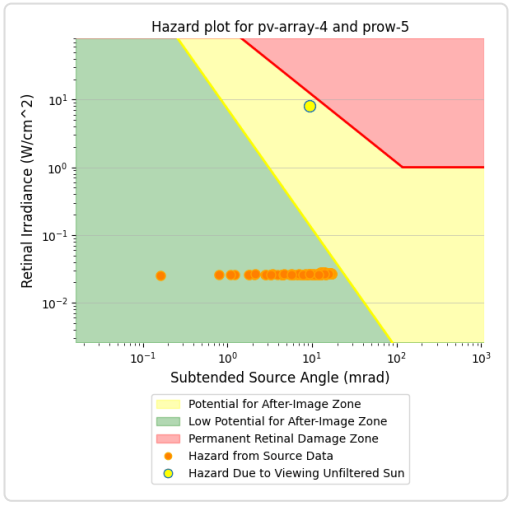
PV array 4 and Route: PRoW 5

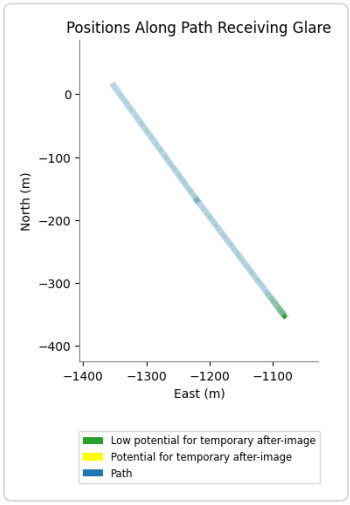
Yellow glare: none

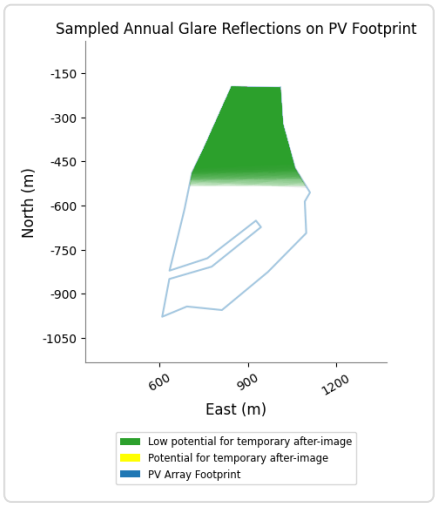
Green glare: 132 min.











PV array 4 and Route: PRoW 12

No glare found

PV array 4 and Route: PRoW 14

No glare found

PV array 4 and Route: PRoW 6

No glare found

PV array 4 and Route: Route 15

No glare found

PV: PV array 5 potential temporary after-image

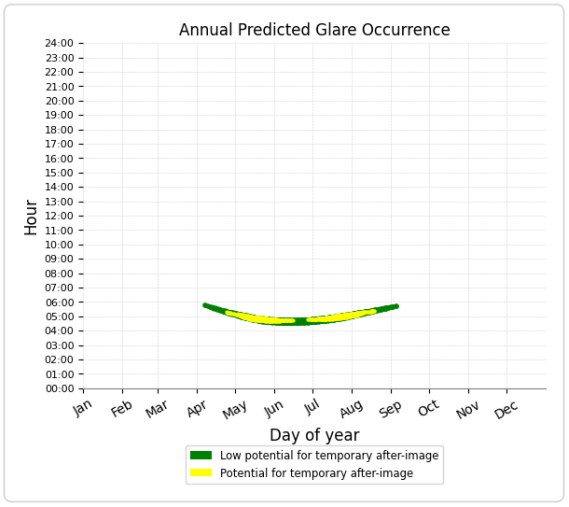
Receptor results ordered by category of glare

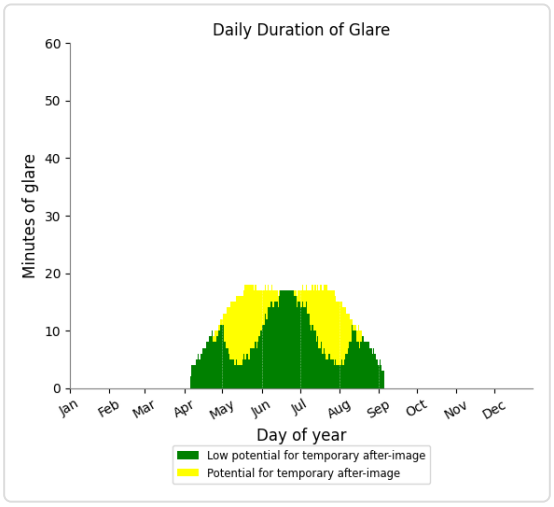
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2	1,337	22.3	721	12.0
PRoW 7	981	16.4	24	0.4
PRoW 8	7,858	131.0	19,685	328.1
Route 10	1,149	19.1	1,132	18.9
PRoW 13	97	1.6	0	0.0
PRoW 1	0	0.0	0	0.0
PRoW 12	0	0.0	0	0.0
PRoW 11	0	0.0	0	0.0
PRoW 14	0	0.0	0	0.0
PRoW 3	0	0.0	0	0.0
PRoW 4	0	0.0	0	0.0
PRoW 5	0	0.0	0	0.0
PRoW 6	0	0.0	0	0.0
PRoW 9	0	0.0	0	0.0
Route 15	0	0.0	0	0.0

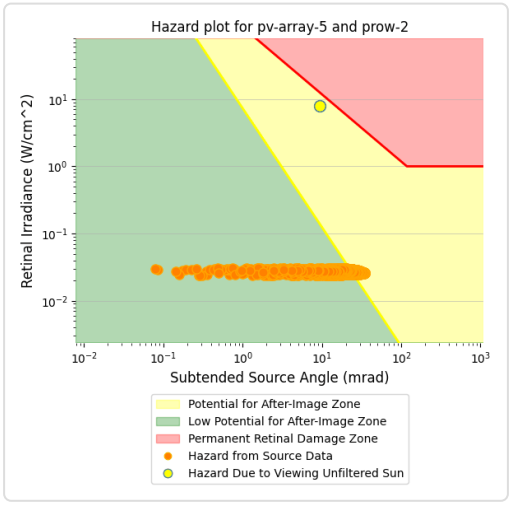
PV array 5 and Route: PRoW 2

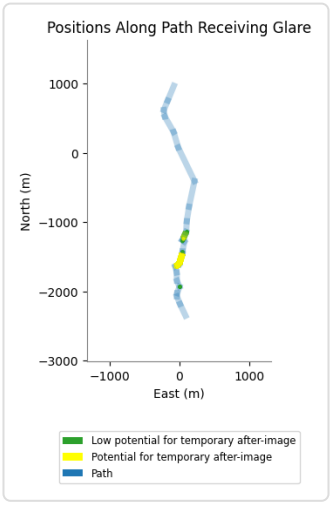
Yellow glare: 721 min.

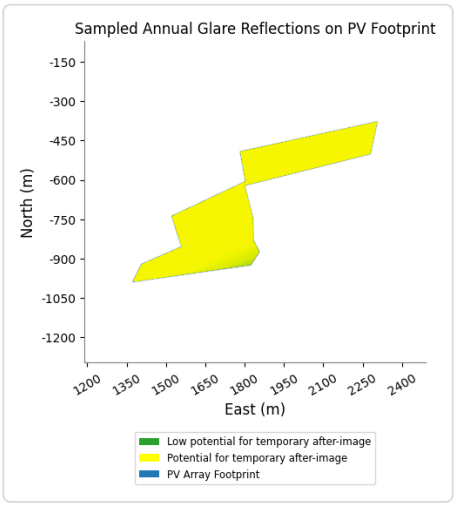
Green glare: 1,337 min.







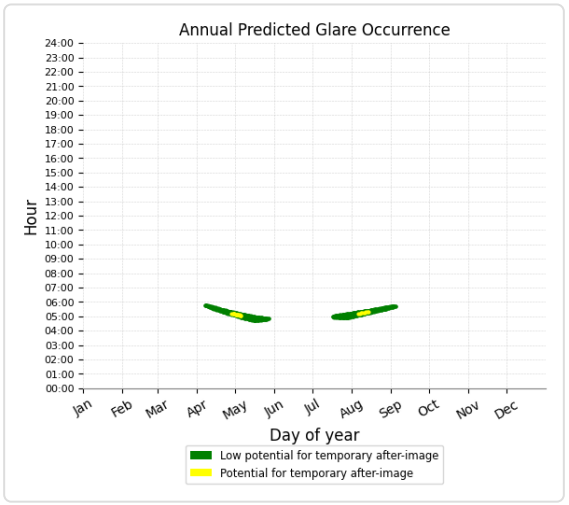


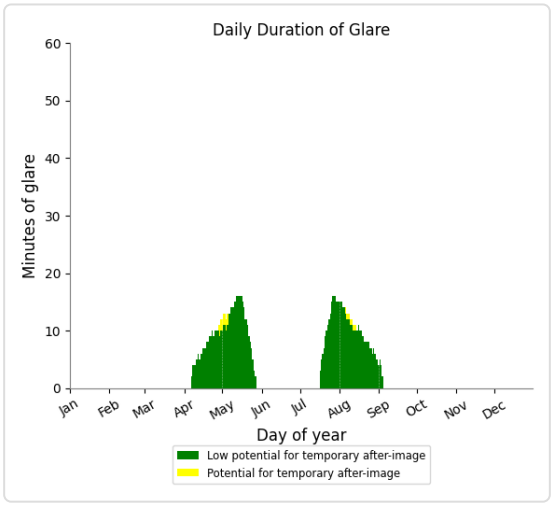


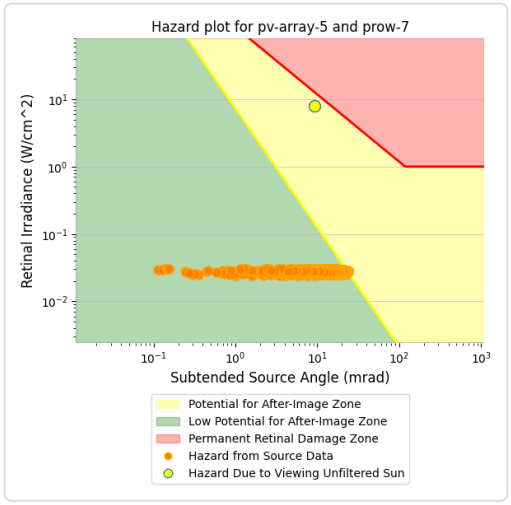
PV array 5 and Route: PRoW 7

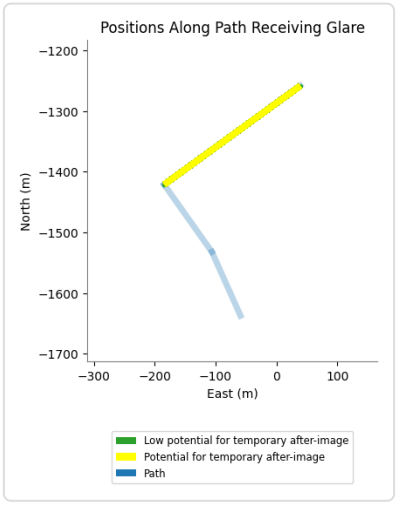
Yellow glare: 24 min.

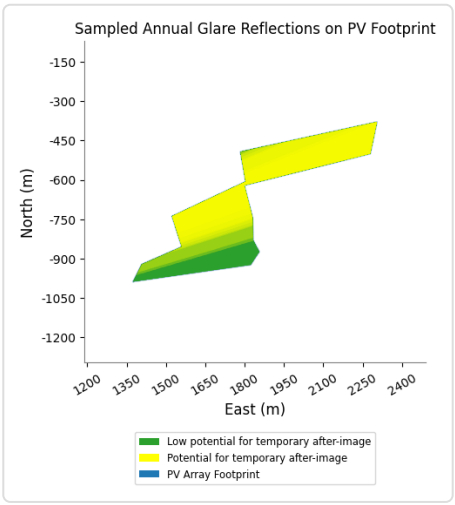
Green glare: 981 min.







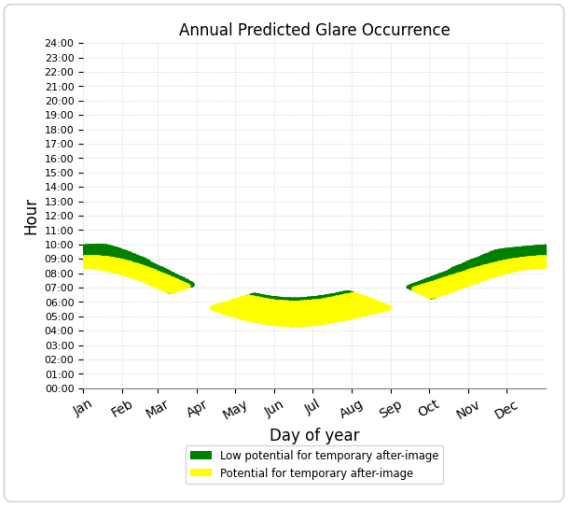


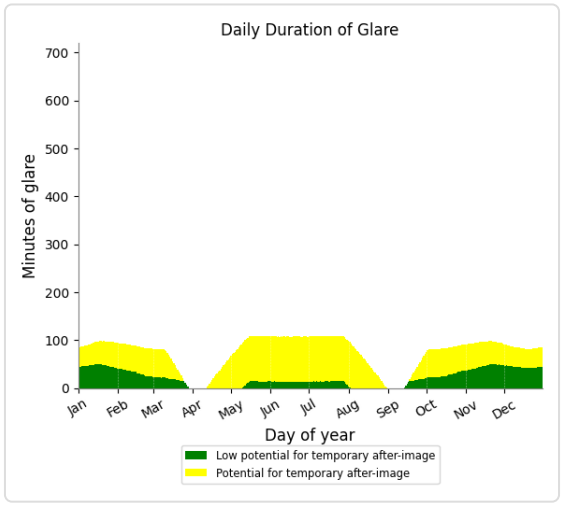


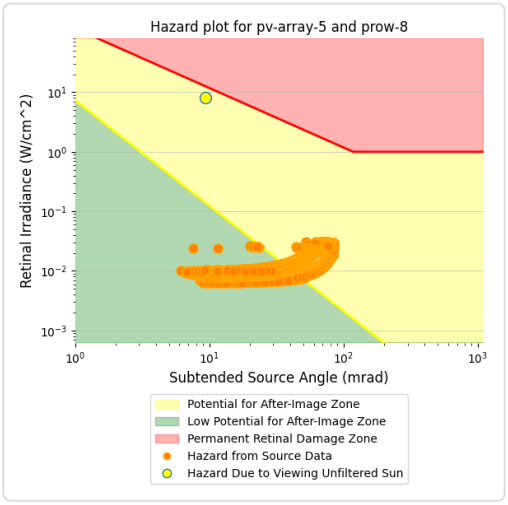
PV array 5 and Route: PRoW 8

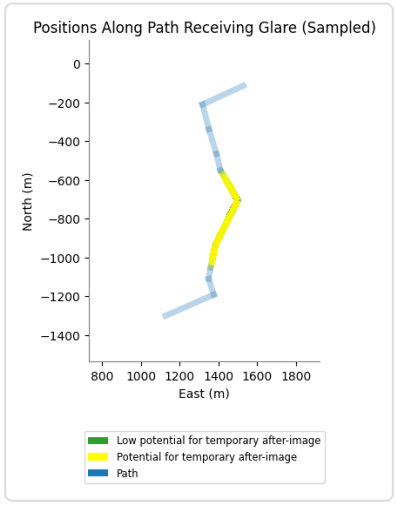
Yellow glare: 19,685 min.

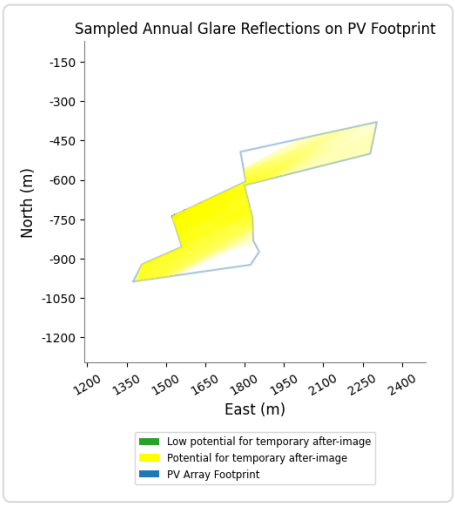
Green glare: 7,858 min.







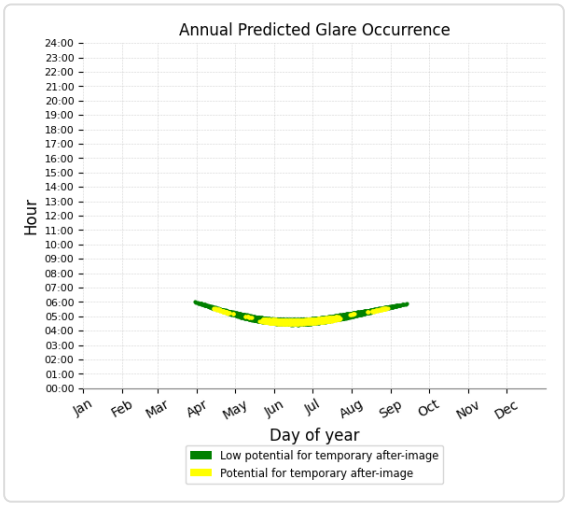


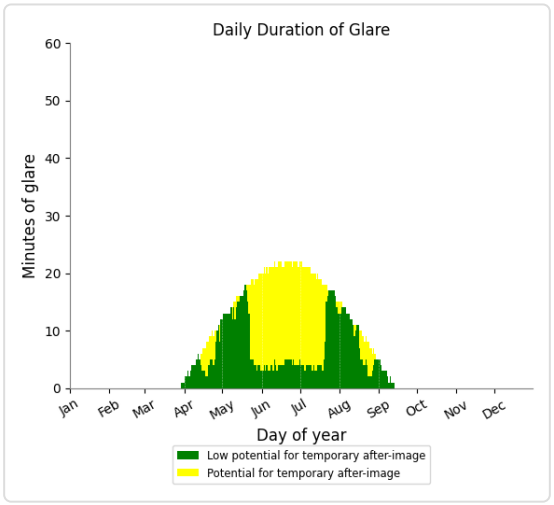


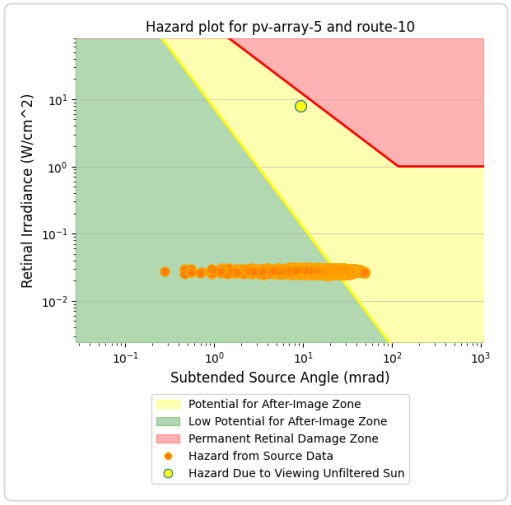
PV array 5 and Route: Route 10

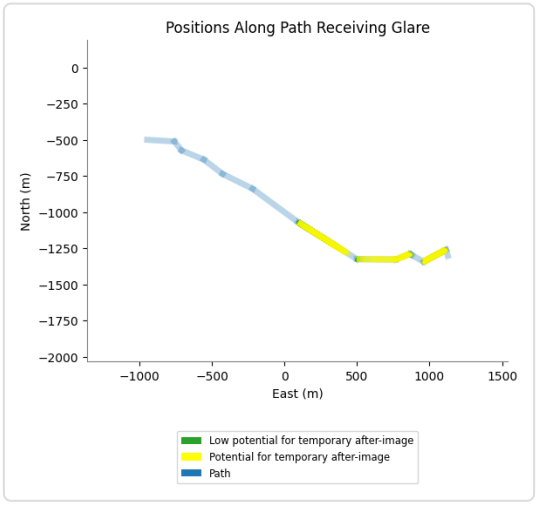
Yellow glare: 1,132 min.

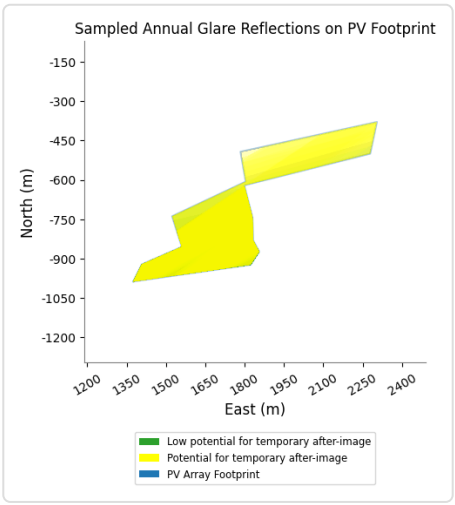
Green glare: 1,149 min.







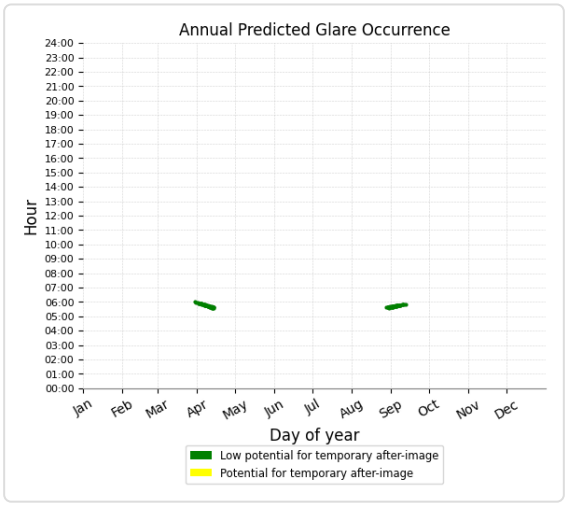


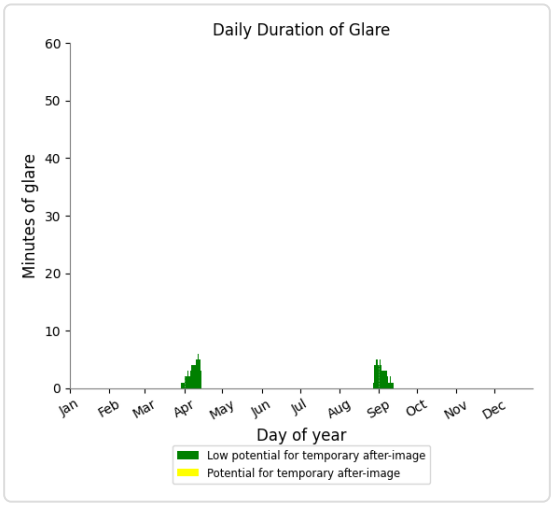


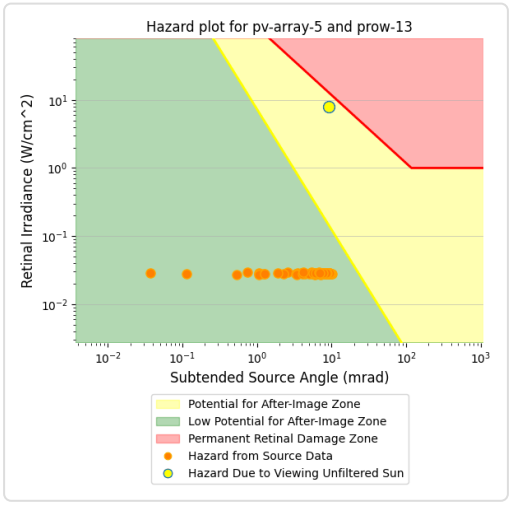
PV array 5 and Route: PRoW 13

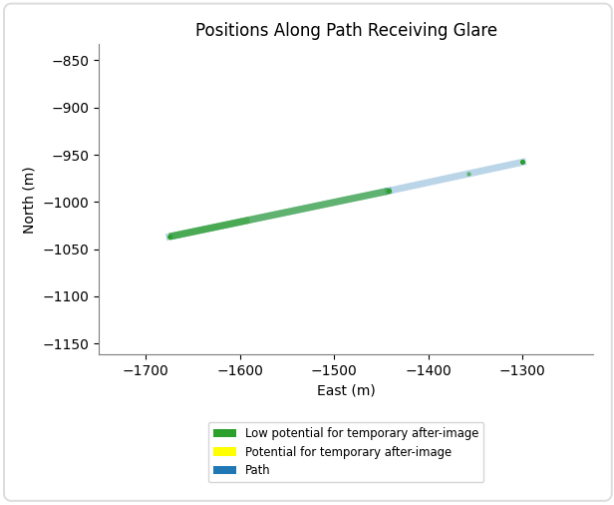
Yellow glare: none

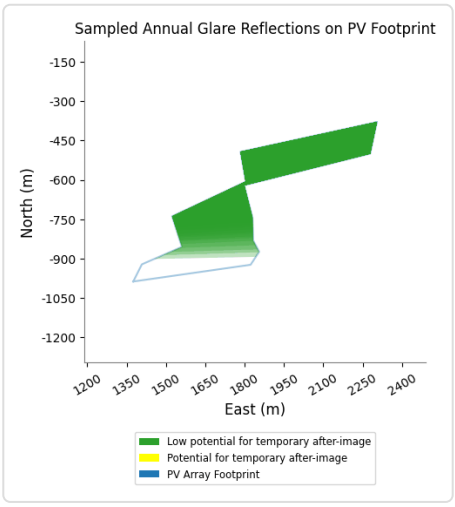
Green glare: 97 min.











PV array 5 and Route: PRoW 1

No glare found

PV array 5 and Route: PRoW 12

No glare found

PV array 5 and Route: PRoW 11

No glare found

PV array 5 and Route: PRoW 14

No glare found

PV array 5 and Route: PRoW 3

No glare found

PV array 5 and Route: PRoW 4

No glare found

PV array 5 and Route: PRoW 5

No glare found

PV array 5 and Route: PRoW 6

No glare found

PV array 5 and Route: PRoW 9

No glare found

PV array 5 and Route: Route 15

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 1**
Site configuration: **JS W1 PRoWs-temp-2**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 500 kW to 1 MW
Site ID 153742.25566

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	6,820	113.7	38,627	643.8	-
PV array 2	25.0	180.0	419,178	6,986.3	216,269	3,604.5	-
PV array 3	25.0	180.0	9,574	159.6	10,376	172.9	-
PV array 4	25.0	180.0	6,181	103.0	8,359	139.3	-
PV array 5	25.0	180.0	5,420	90.3	14,320	238.7	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

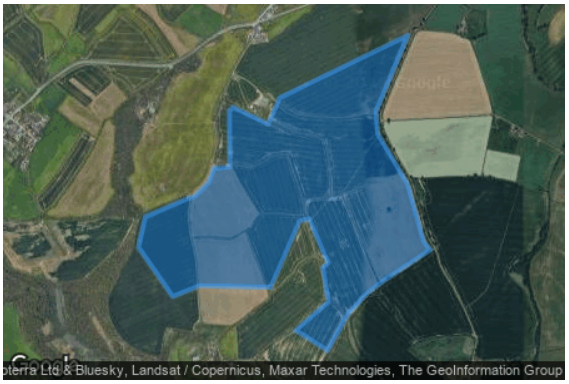
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	135,825	2,263.8	75,969	1,266.2
PRoW 12	1,140	19.0	3,103	51.7
PRoW 11	865	14.4	2,525	42.1
PRoW 13	4,021	67.0	2,308	38.5
PRoW 14	2,629	43.8	7,791	129.8
PRoW 2	134,643	2,244.1	60,143	1,002.4
PRoW 3	12,559	209.3	21,424	357.1
PRoW 4	2,536	42.3	6,583	109.7
PRoW 5	31	0.5	38	0.6
PRoW 6	2,444	40.7	4,290	71.5
PRoW 7	3,925	65.4	6,444	107.4
PRoW 8	5,374	89.6	24,134	402.2

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 9	5,309	88.5	9,539	159.0
Route 10	133,841	2,230.7	56,584	943.1
Route 15	2,031	33.9	7,076	117.9

Component Data

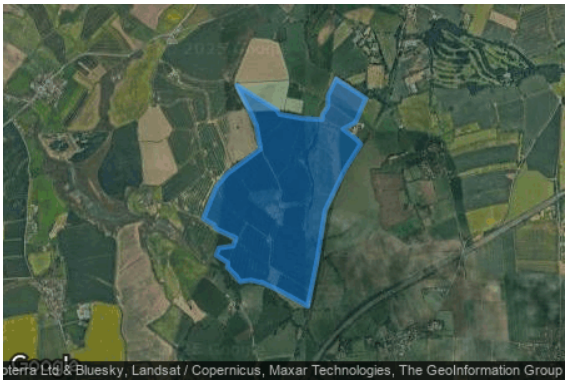
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.462880	-1.242763	80.60	3.80	84.40
2	53.461615	-1.245982	76.30	3.80	80.10
3	53.461117	-1.247097	70.70	3.80	74.50
4	53.460248	-1.248428	70.10	3.80	73.90
5	53.458766	-1.249812	78.70	3.80	82.50
6	53.459596	-1.252011	72.20	3.80	76.00
7	53.460759	-1.249780	66.60	3.80	70.40
8	53.462151	-1.250155	67.40	3.80	71.20
9	53.462362	-1.249769	66.30	3.80	70.10
10	53.462650	-1.250026	65.00	3.80	68.80
11	53.464150	-1.251099	66.70	3.80	70.50
12	53.464047	-1.251754	66.20	3.80	70.00
13	53.461346	-1.253738	60.60	3.80	64.40
14	53.461416	-1.258599	63.50	3.80	67.30
15	53.460975	-1.260476	67.20	3.80	71.00
16	53.462983	-1.262831	82.20	3.80	86.00
17	53.464219	-1.262370	83.30	3.80	87.10
18	53.464950	-1.259516	81.10	3.80	84.90
19	53.465077	-1.258915	80.50	3.80	84.30
20	53.465639	-1.257976	79.10	3.80	82.90
21	53.466204	-1.257649	78.40	3.80	82.20
22	53.466262	-1.256555	76.60	3.80	80.40
23	53.468550	-1.256575	78.50	3.80	82.30
24	53.468697	-1.256344	78.50	3.80	82.30
25	53.468007	-1.253919	78.10	3.80	81.90
26	53.469079	-1.253110	78.90	3.80	82.70
27	53.471629	-1.244293	77.00	3.80	80.80
28	53.468512	-1.246508	83.60	3.80	87.40
29	53.467605	-1.246379	82.70	3.80	86.50
30	53.465556	-1.244326	78.30	3.80	82.10
31	53.463205	-1.243211	79.60	3.80	83.40

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451858	-1.242251	76.10	3.80	79.90
2	53.452101	-1.243817	77.00	3.80	80.80
3	53.451968	-1.245330	76.40	3.80	80.20
4	53.452365	-1.245780	77.10	3.80	80.90
5	53.453157	-1.247089	73.80	3.80	77.60
6	53.453508	-1.247014	77.60	3.80	81.40
7	53.454133	-1.248632	80.80	3.80	84.60
8	53.454727	-1.248246	84.60	3.80	88.40
9	53.454880	-1.246271	89.30	3.80	93.10
10	53.455544	-1.245960	90.30	3.80	94.10
11	53.456142	-1.248170	86.90	3.80	90.70
12	53.456356	-1.248750	84.00	3.80	87.80
13	53.456595	-1.248900	83.60	3.80	87.40
14	53.457132	-1.250386	76.70	3.80	80.50
15	53.459695	-1.248626	72.60	3.80	76.40
16	53.460821	-1.247009	71.40	3.80	75.20
17	53.462776	-1.242546	80.50	3.80	84.30
18	53.464717	-1.243104	76.10	3.80	79.90
19	53.465886	-1.244037	77.30	3.80	81.10
20	53.467981	-1.245797	82.50	3.80	86.30
21	53.465982	-1.240304	65.80	3.80	69.60
22	53.465631	-1.239928	65.40	3.80	69.20
23	53.465299	-1.236903	62.50	3.80	66.30
24	53.465190	-1.234070	62.90	3.80	66.70
25	53.465573	-1.234006	62.10	3.80	65.90
26	53.466250	-1.233276	60.40	3.80	64.20
27	53.467151	-1.233244	57.90	3.80	61.70
28	53.468498	-1.232139	55.90	3.80	59.70
29	53.466900	-1.228049	68.80	3.80	72.60
30	53.464957	-1.229472	73.50	3.80	77.30
31	53.464421	-1.231172	72.30	3.80	76.10
32	53.464012	-1.230260	76.50	3.80	80.30
33	53.463498	-1.229219	81.20	3.80	85.00
34	53.463171	-1.228764	83.80	3.80	87.60
35	53.461159	-1.230909	82.30	3.80	86.10
36	53.457824	-1.233656	80.90	3.80	84.70
37	53.454042	-1.234665	90.90	3.80	94.70
38	53.449966	-1.236038	96.00	3.80	99.80
39	53.451282	-1.240093	81.60	3.80	85.40
40	53.451947	-1.242432	76.70	3.80	80.50

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465402	-1.224873	79.20	3.80	83.00
2	53.464182	-1.223639	86.50	3.80	90.30
3	53.463831	-1.223800	88.00	3.80	91.80
4	53.463365	-1.223832	90.80	3.80	94.60
5	53.462553	-1.223071	99.60	3.80	103.40
6	53.462336	-1.225077	95.10	3.80	98.90
7	53.461883	-1.225410	97.70	3.80	101.50
8	53.463959	-1.226901	83.10	3.80	86.90
9	53.465198	-1.225764	78.40	3.80	82.20

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461091	-1.227555	95.90	3.80	99.70
2	53.461116	-1.230044	85.70	3.80	89.50
3	53.459289	-1.231418	86.80	3.80	90.60
4	53.458484	-1.232072	86.60	3.80	90.40
5	53.457366	-1.232458	86.30	3.80	90.10
6	53.455504	-1.233220	87.80	3.80	91.60
7	53.455881	-1.231289	90.00	3.80	93.80
8	53.457031	-1.228800	97.30	3.80	101.10
9	53.456833	-1.228542	98.40	3.80	102.20
10	53.455625	-1.231064	90.90	3.80	94.70
11	53.455248	-1.233231	88.10	3.80	91.90
12	53.454096	-1.233596	89.80	3.80	93.60
13	53.454409	-1.232330	90.00	3.80	93.80
14	53.454301	-1.230538	93.40	3.80	97.20
15	53.455464	-1.228188	98.40	3.80	102.20
16	53.456651	-1.226227	103.50	3.80	107.30
17	53.457615	-1.226302	104.50	3.80	108.30
18	53.457890	-1.226034	105.80	3.80	109.60
19	53.458637	-1.226806	103.70	3.80	107.50
20	53.459987	-1.227433	98.50	3.80	102.30

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454007	-1.222055	116.70	3.80	120.50
2	53.454582	-1.215318	126.90	3.80	130.70
3	53.455030	-1.214824	128.20	3.80	132.00
4	53.455413	-1.215167	129.90	3.80	133.70
5	53.456205	-1.215210	132.10	3.80	135.90
6	53.457304	-1.215682	132.20	3.80	136.00
7	53.458390	-1.208451	120.40	3.80	124.20
8	53.459476	-1.208065	122.00	3.80	125.80
9	53.458454	-1.215897	130.70	3.80	134.50
10	53.457432	-1.215597	131.70	3.80	135.50
11	53.456243	-1.219824	133.90	3.80	137.70
12	53.455196	-1.219266	129.10	3.80	132.90
13	53.454595	-1.221562	118.00	3.80	121.80

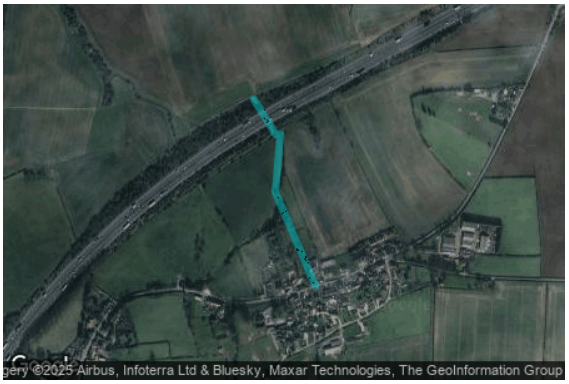
Route Receptors

Name: PRoW 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.467583	-1.235933	60.20	2.50	62.70
2	53.461835	-1.237564	74.40	2.50	76.90
3	53.460929	-1.240791	82.40	2.50	84.90

Name: PRoW 12
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451170	-1.225774	107.79	2.50	110.29
2	53.450453	-1.225020	110.88	2.50	113.38
3	53.450463	-1.224864	111.02	2.50	113.52
4	53.449281	-1.225038	113.36	2.50	115.86
5	53.447374	-1.223666	132.68	2.50	135.18

Name: PRoW 11
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451113	-1.223105	112.70	2.50	115.20
2	53.449666	-1.221973	116.50	2.50	119.00
3	53.448190	-1.220546	129.70	2.50	132.20

Name: PRoW 13
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454275	-1.262334	74.40	2.50	76.90
2	53.454000	-1.264479	75.50	2.50	78.00
3	53.453566	-1.267977	83.10	2.50	85.60

Name: PRoW 14
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.463046	-1.217388	117.90	2.50	120.40
2	53.463269	-1.215983	121.10	2.50	123.60
3	53.463697	-1.215919	119.10	2.50	121.60
4	53.464400	-1.210200	124.30	2.50	126.80
5	53.464681	-1.210050	124.20	2.50	126.70
6	53.464892	-1.209707	123.90	2.50	126.40
7	53.465013	-1.209728	123.70	2.50	126.20

Name: PRoW 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.471571	-1.243976	76.60	2.50	79.10
2	53.469652	-1.245312	81.60	2.50	84.10
3	53.468436	-1.246151	84.10	2.50	86.60
4	53.467584	-1.245941	83.00	2.50	85.50
5	53.465575	-1.244032	80.20	2.50	82.70
6	53.463573	-1.243034	81.00	2.50	83.50
7	53.459213	-1.239510	83.20	2.50	85.70
8	53.455892	-1.240692	92.90	2.50	95.40
9	53.454013	-1.241175	97.60	2.50	100.10
10	53.452638	-1.241315	90.10	2.50	92.60
11	53.451750	-1.241958	76.80	2.50	79.30
12	53.451569	-1.242142	73.80	2.50	76.30
13	53.451358	-1.241702	77.10	2.50	79.60
14	53.450115	-1.242099	85.50	2.50	88.00
15	53.449831	-1.242121	88.00	2.50	90.50
16	53.448431	-1.242856	98.20	2.50	100.70
17	53.448147	-1.243655	99.80	2.50	102.30
18	53.447377	-1.243376	101.70	2.50	104.20
19	53.446294	-1.243306	105.90	2.50	108.40
20	53.445524	-1.242754	108.20	2.50	110.70
21	53.444699	-1.243269	112.10	2.50	114.60
22	53.444255	-1.243312	113.50	2.50	116.00
23	53.443284	-1.242647	114.70	2.50	117.20
24	53.441763	-1.241445	113.20	2.50	115.70

Name: PRoW 3
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.467597	-1.246139	82.80	2.50	85.30
2	53.465112	-1.248810	74.70	2.50	77.20
3	53.464895	-1.249658	72.00	2.50	74.50
4	53.463924	-1.251353	66.40	2.50	68.90
5	53.461152	-1.253617	60.40	2.50	62.90
6	53.460806	-1.253729	61.10	2.50	63.60
7	53.459791	-1.256002	59.70	2.50	62.20
8	53.458970	-1.257477	60.40	2.50	62.90

Name: PRoW 4
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.468966	-1.257198	82.00	2.50	84.50
2	53.468480	-1.257542	81.70	2.50	84.20
3	53.466564	-1.257606	80.60	2.50	83.10
4	53.465159	-1.259108	81.40	2.50	83.90
5	53.464246	-1.259398	77.40	2.50	79.90
6	53.462259	-1.258797	67.30	2.50	69.80
7	53.460032	-1.258579	61.50	2.50	64.00
8	53.459725	-1.259008	60.70	2.50	63.20

Name: PRoW 5
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.463002	-1.263113	83.00	2.50	85.50
2	53.461367	-1.261128	70.70	2.50	73.20
3	53.459719	-1.259047	60.50	2.50	63.00

Name: PRoW 6
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.466913	-1.270140	48.20	2.50	50.70
2	53.466392	-1.270387	47.10	2.50	49.60
3	53.465421	-1.270269	40.90	2.50	43.40
4	53.464336	-1.269486	43.20	2.50	45.70
5	53.464128	-1.269113	43.30	2.50	45.80
6	53.464188	-1.265631	57.40	2.50	59.90
7	53.464325	-1.262796	81.80	2.50	84.30

Name: PRoW 7
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451573	-1.242169	73.50	2.50	76.00
2	53.450110	-1.245538	80.20	2.50	82.70
3	53.449113	-1.244357	91.90	2.50	94.40
4	53.448168	-1.243649	99.70	2.50	102.20

Name: PRoW 8
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461851	-1.219755	122.70	2.50	125.20
2	53.460986	-1.222920	119.50	2.50	122.00
3	53.459839	-1.222427	126.40	2.50	128.90
4	53.458695	-1.221842	131.50	2.50	134.00
5	53.457941	-1.221536	135.00	2.50	137.50
6	53.456538	-1.220180	136.00	2.50	138.50
7	53.454456	-1.221927	116.60	2.50	119.10
8	53.453427	-1.222292	116.50	2.50	119.00
9	53.452897	-1.222442	116.10	2.50	118.60
10	53.452169	-1.222051	117.10	2.50	119.60
11	53.451188	-1.225800	107.70	2.50	110.20

Name: PRoW 9
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.464679	-1.228221	77.40	2.50	79.90
2	53.464021	-1.227245	82.10	2.50	84.60
3	53.461557	-1.225388	100.00	2.50	102.50
4	53.461534	-1.221680	121.20	2.50	123.70
5	53.461359	-1.221589	123.70	2.50	126.20

Name: Route 10
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451182	-1.225809	107.70	2.50	110.20
2	53.451559	-1.226002	106.10	2.50	108.60
3	53.450817	-1.228330	101.40	2.50	103.90
4	53.451303	-1.229784	96.80	2.50	99.30
5	53.450952	-1.231205	96.80	2.50	99.30
6	53.450980	-1.235264	98.40	2.50	100.90
7	53.453268	-1.241358	95.70	2.50	98.20
8	53.455344	-1.246079	90.00	2.50	92.50
9	53.456266	-1.249198	79.50	2.50	82.00
10	53.457154	-1.251144	72.40	2.50	74.90
11	53.457726	-1.253461	72.30	2.50	74.80
12	53.458282	-1.254207	72.20	2.50	74.70
13	53.458384	-1.257025	63.00	2.50	65.50

Name: Route 15
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.464643	-1.227971	77.70	2.50	80.20
2	53.465349	-1.226357	76.30	2.50	78.80
3	53.466020	-1.225847	75.60	2.50	78.10
4	53.465873	-1.225230	77.30	2.50	79.80
5	53.466540	-1.223203	81.30	2.50	83.80

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	6,820	113.7	38,627	643.8	-
PV array 2	25.0	180.0	419,178	6,986.3	216,269	3,604.5	-
PV array 3	25.0	180.0	9,574	159.6	10,376	172.9	-
PV array 4	25.0	180.0	6,181	103.0	8,359	139.3	-
PV array 5	25.0	180.0	5,420	90.3	14,320	238.7	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	135,825	2,263.8	75,969	1,266.2
PRoW 12	1,140	19.0	3,103	51.7
PRoW 11	865	14.4	2,525	42.1
PRoW 13	4,021	67.0	2,308	38.5
PRoW 14	2,629	43.8	7,791	129.8
PRoW 2	134,643	2,244.1	60,143	1,002.4
PRoW 3	12,559	209.3	21,424	357.1
PRoW 4	2,536	42.3	6,583	109.7
PRoW 5	31	0.5	38	0.6
PRoW 6	2,444	40.7	4,290	71.5
PRoW 7	3,925	65.4	6,444	107.4
PRoW 8	5,374	89.6	24,134	402.2
PRoW 9	5,309	88.5	9,539	159.0
Route 10	133,841	2,230.7	56,584	943.1
Route 15	2,031	33.9	7,076	117.9

PV: PV array 1 potential temporary after-image

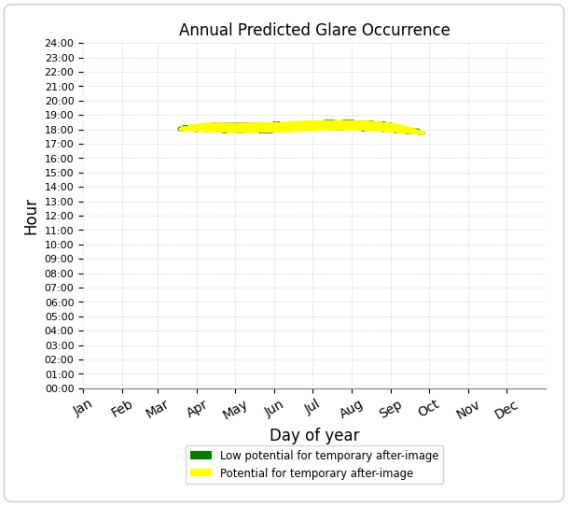
Receptor results ordered by category of glare

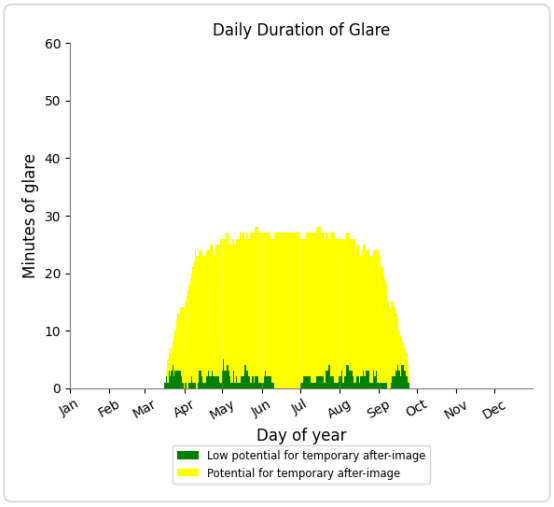
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	326	5.4	4,047	67.5
PRoW 14	1,258	21.0	1,546	25.8
PRoW 2	76	1.3	6,164	102.7
PRoW 3	178	3.0	9,512	158.5
PRoW 4	137	2.3	4,809	80.2
PRoW 6	60	1.0	3,252	54.2
PRoW 8	650	10.8	2,803	46.7
PRoW 9	1,176	19.6	3,372	56.2
Route 10	1,091	18.2	2,363	39.4
Route 15	1,084	18.1	759	12.7
PRoW 12	223	3.7	0	0.0
PRoW 11	536	8.9	0	0.0
PRoW 13	25	0.4	0	0.0
PRoW 5	0	0.0	0	0.0
PRoW 7	0	0.0	0	0.0

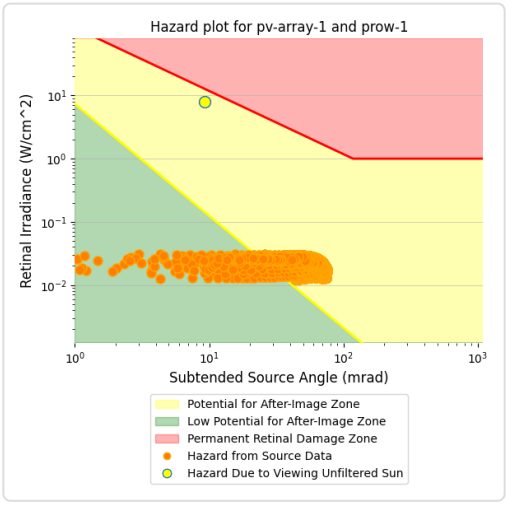
PV array 1 and Route: PRoW 1

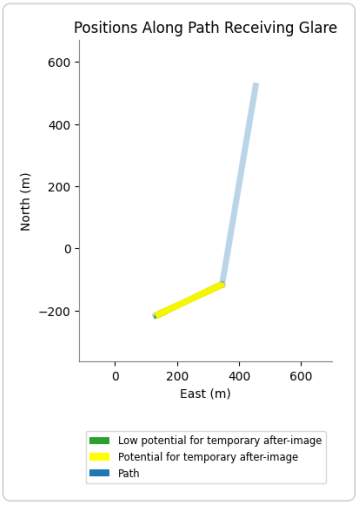
Yellow glare: 4,047 min.

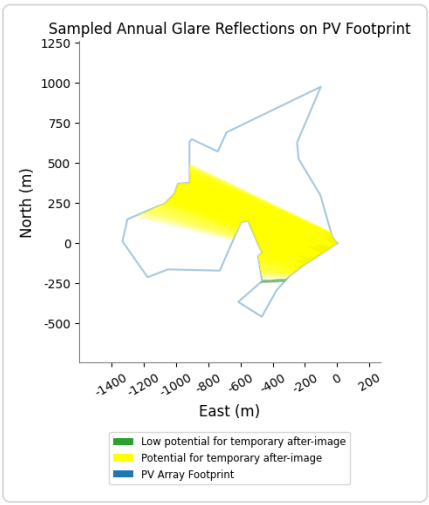
Green glare: 326 min.







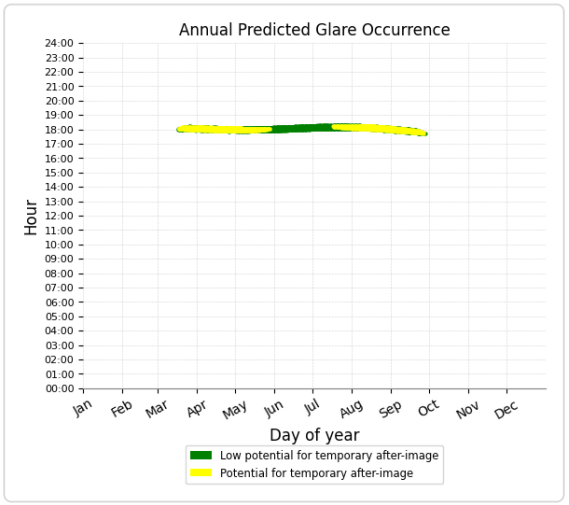


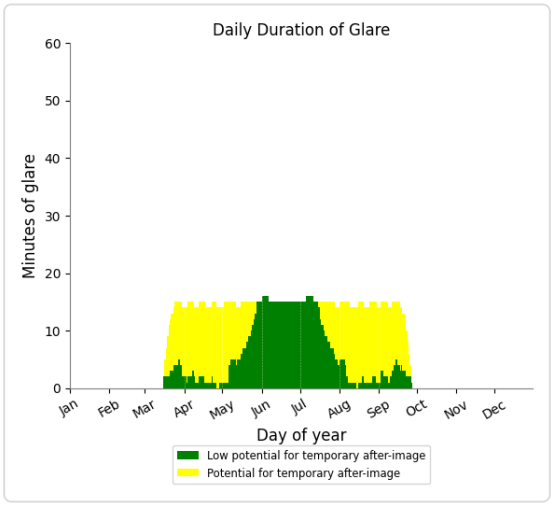


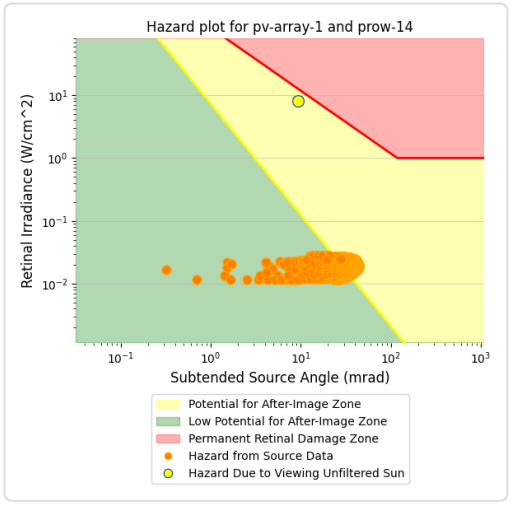
PV array 1 and Route: PRoW 14

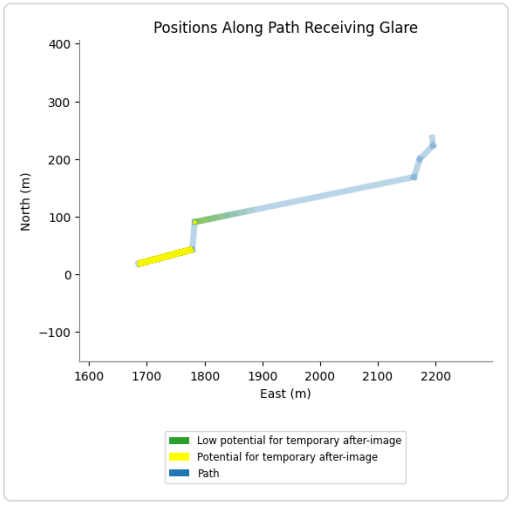
Yellow glare: 1,546 min.

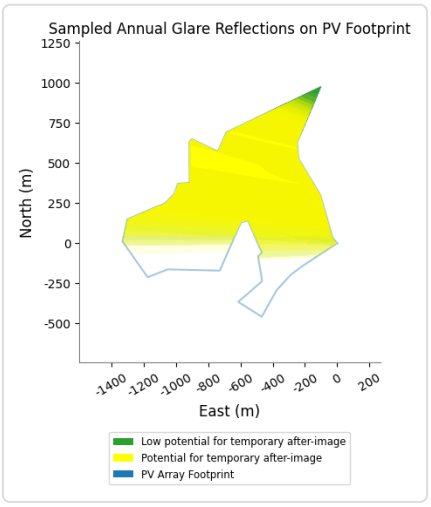
Green glare: 1,258 min.







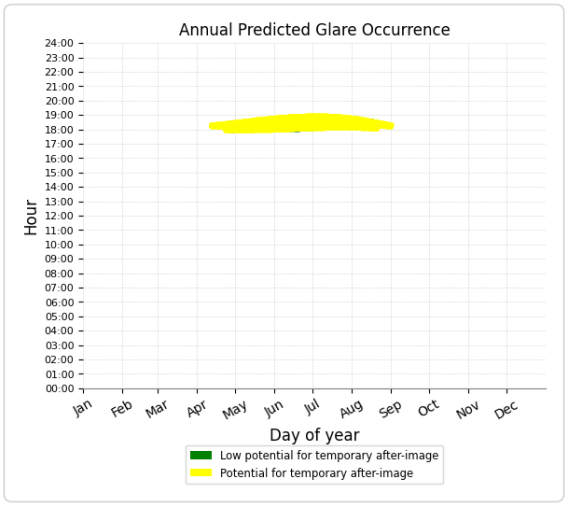


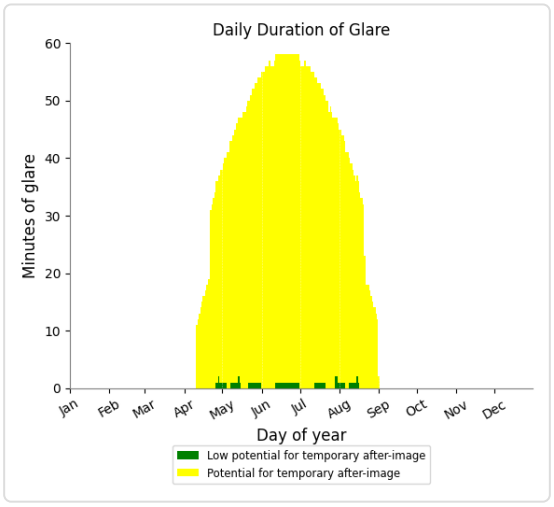


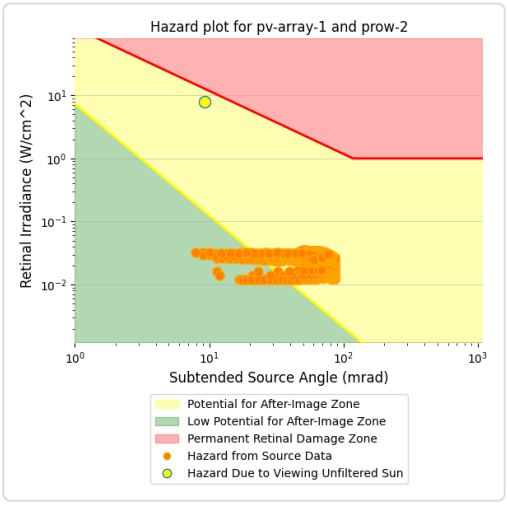
PV array 1 and Route: PRoW 2

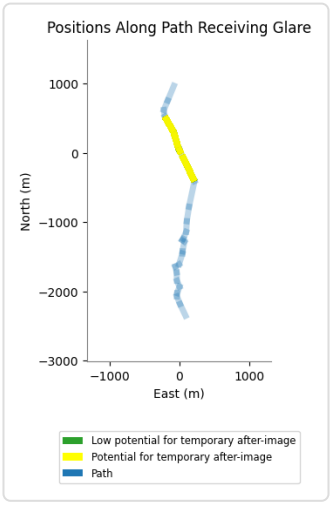
Yellow glare: 6,164 min.

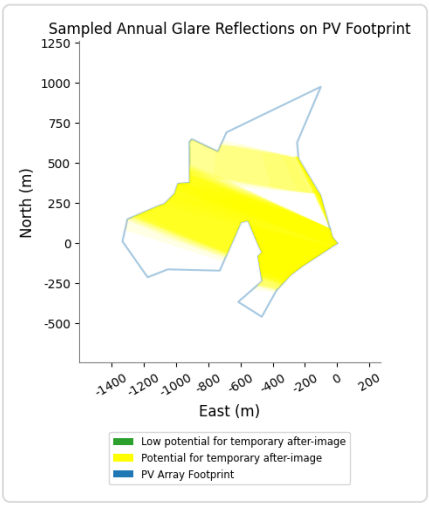
Green glare: 76 min.







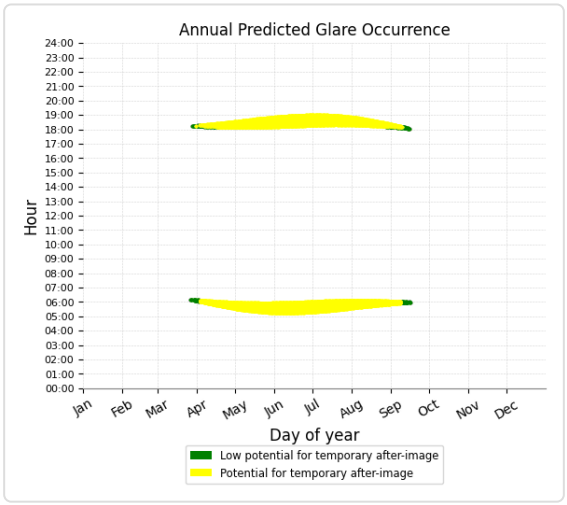


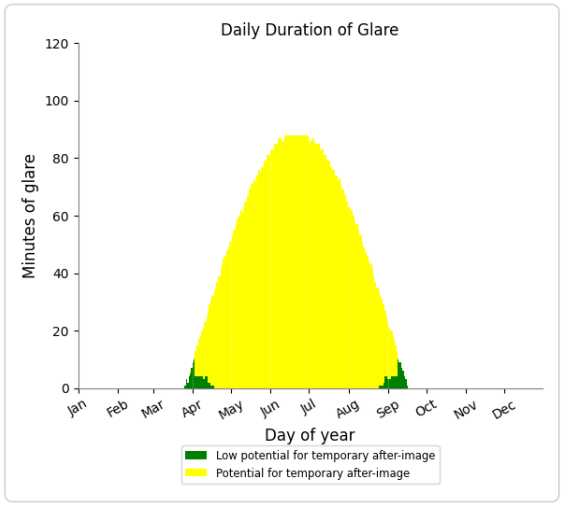


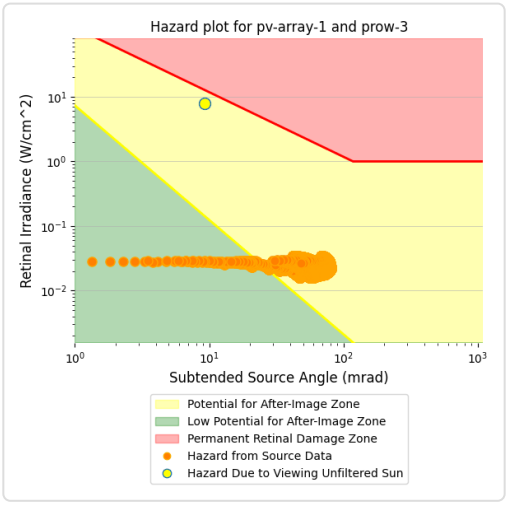
PV array 1 and Route: PRoW 3

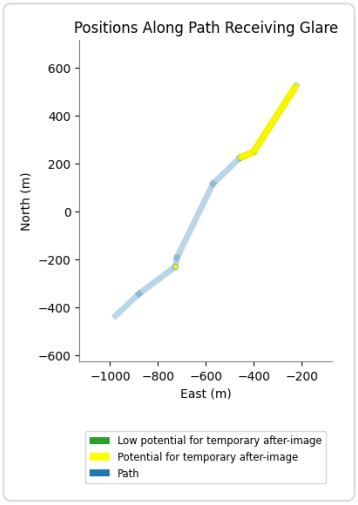
Yellow glare: 9,512 min.

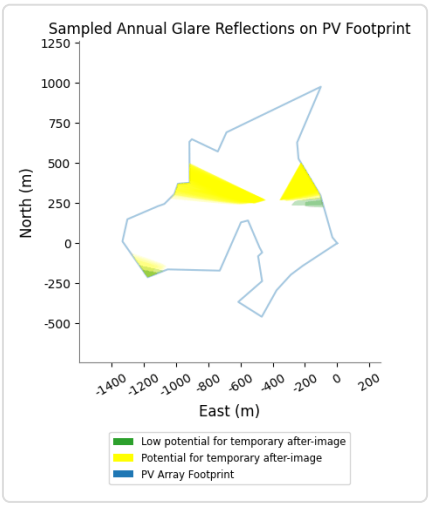
Green glare: 178 min.







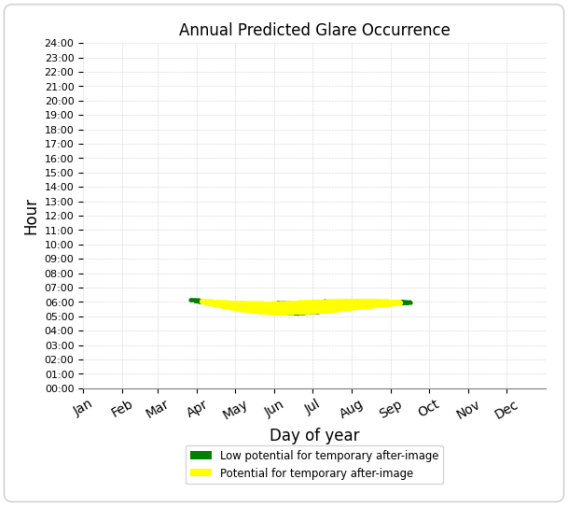


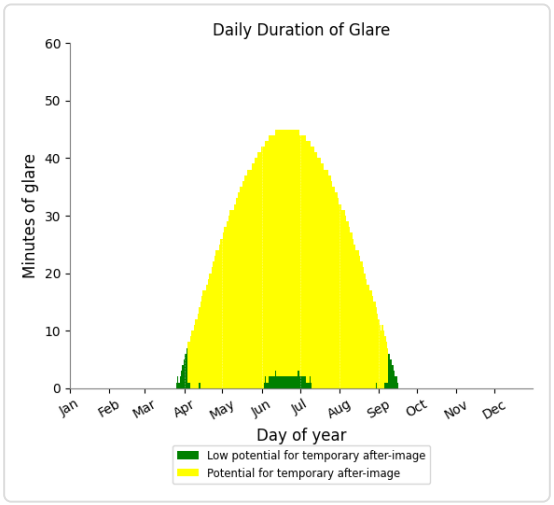


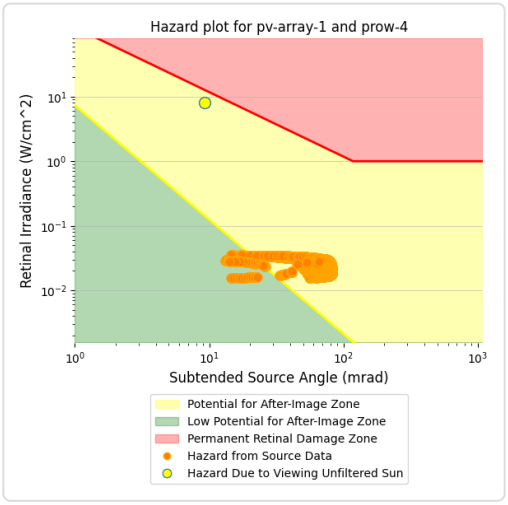
PV array 1 and Route: PRoW 4

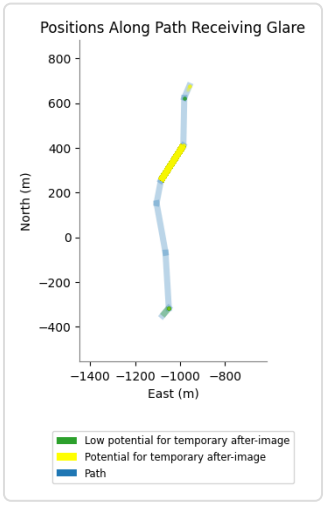
Yellow glare: 4,809 min.

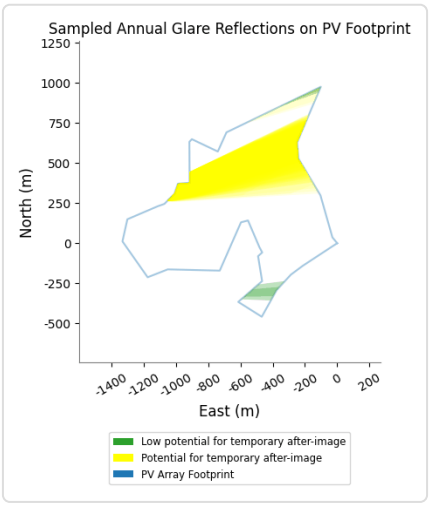
Green glare: 137 min.







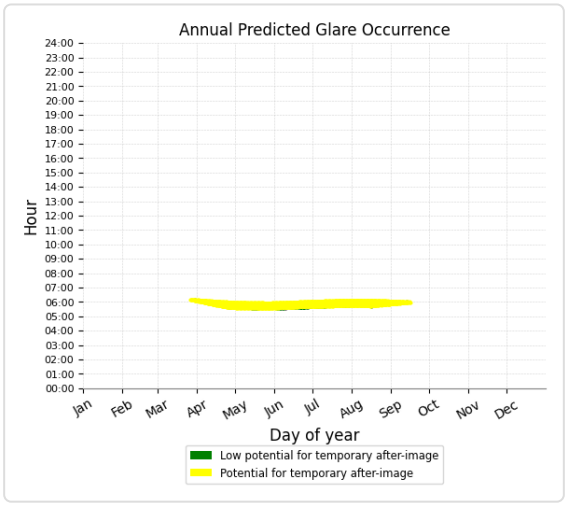


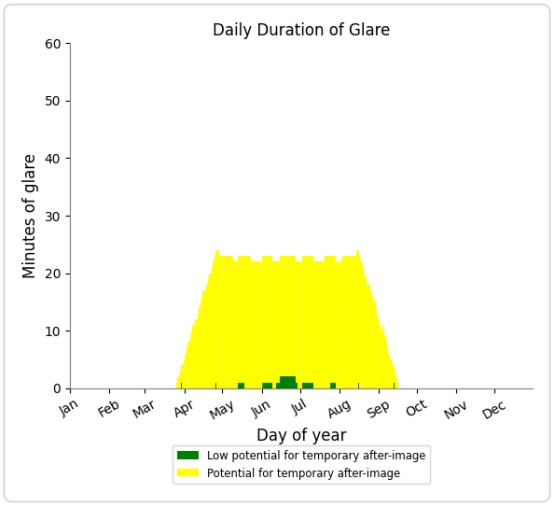


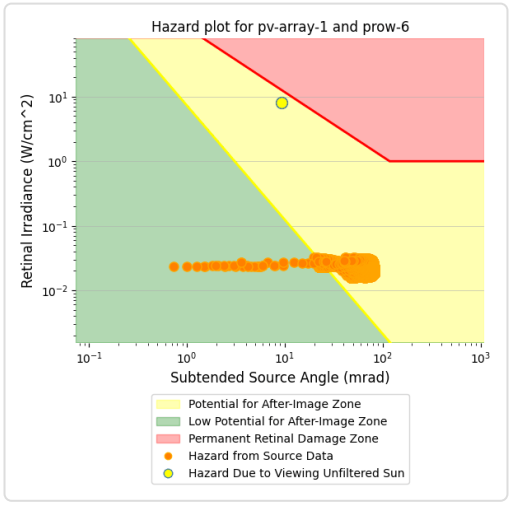
PV array 1 and Route: PRoW 6

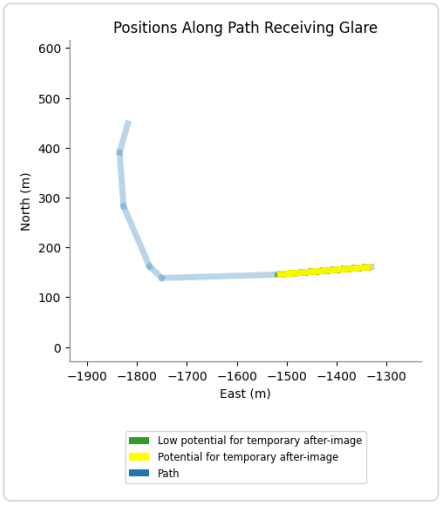
Yellow glare: 3,252 min.

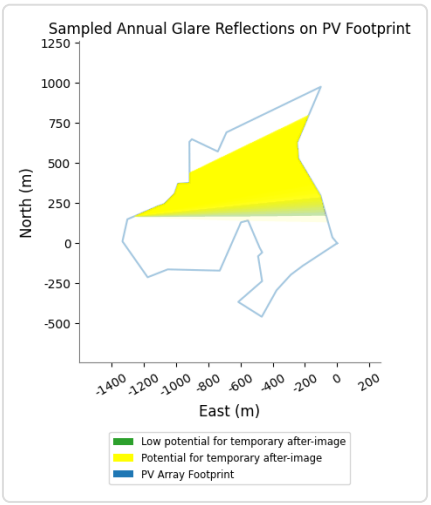
Green glare: 60 min.







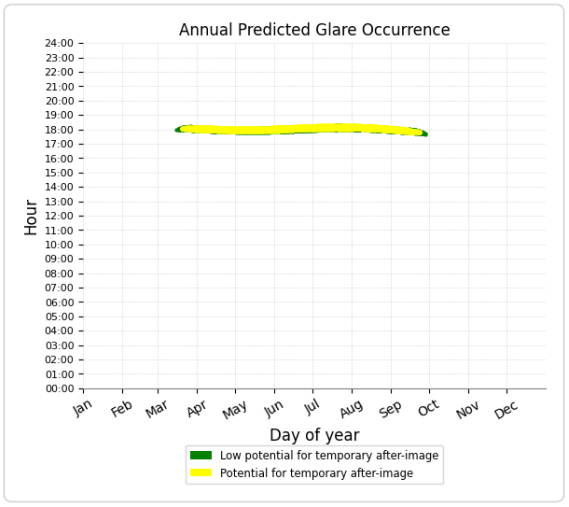


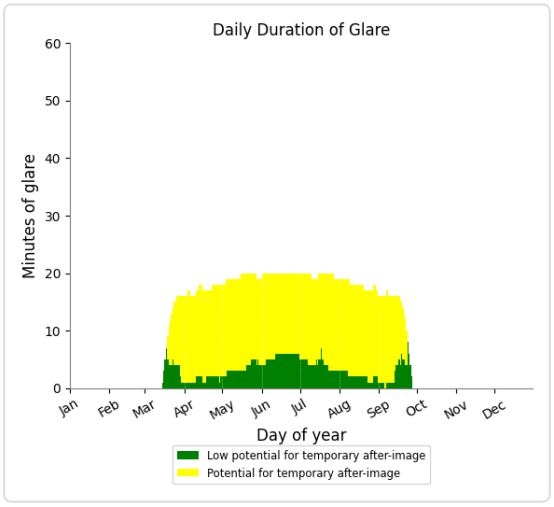


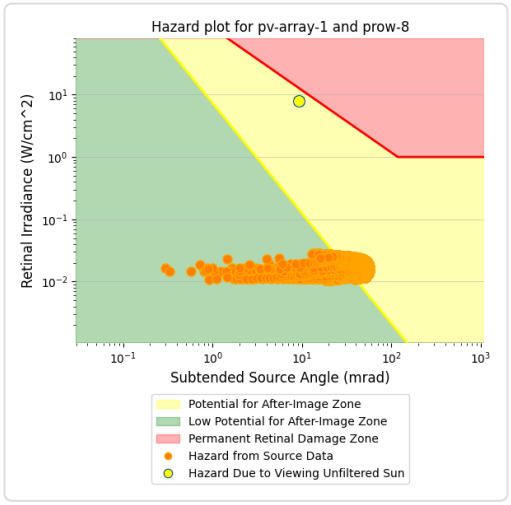
PV array 1 and Route: PRoW 8

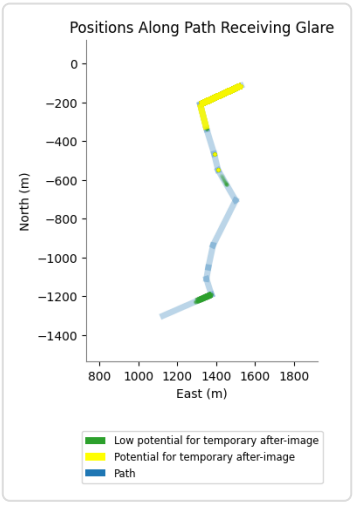
Yellow glare: 2,803 min.

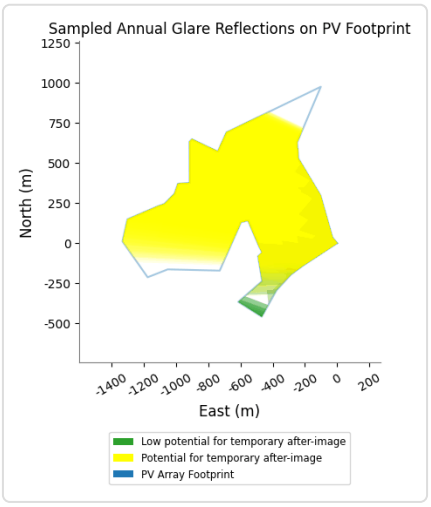
Green glare: 650 min.







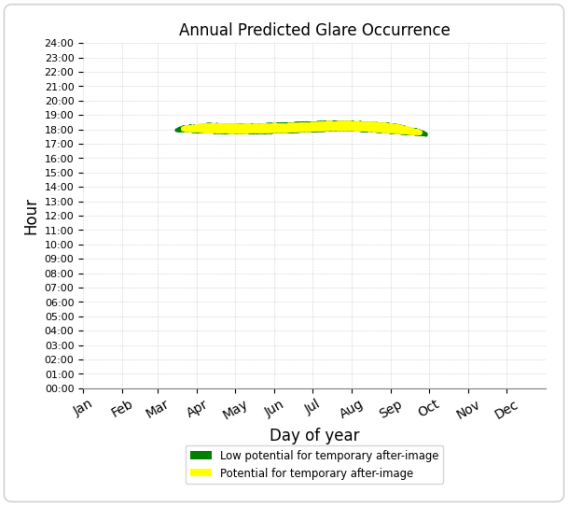


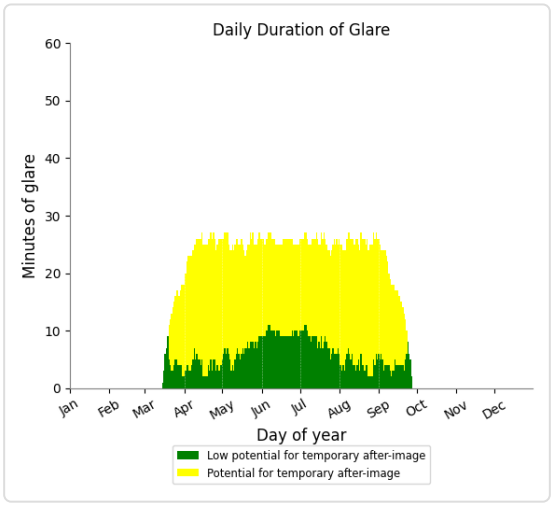


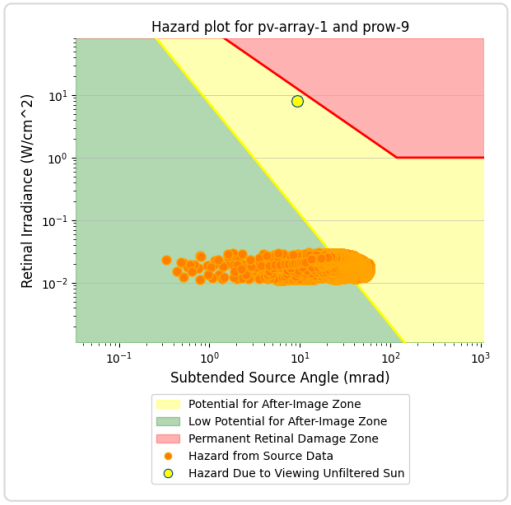
PV array 1 and Route: PRoW 9

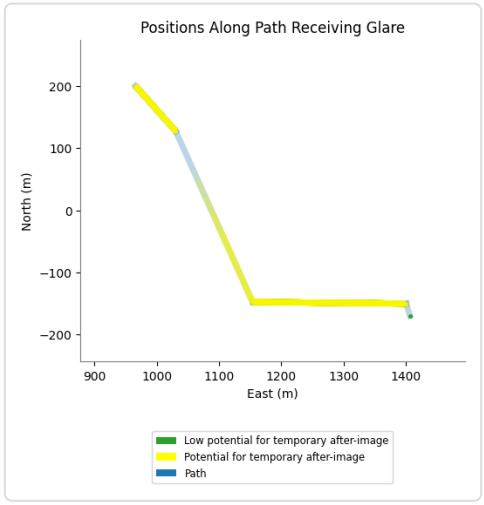
Yellow glare: 3,372 min.

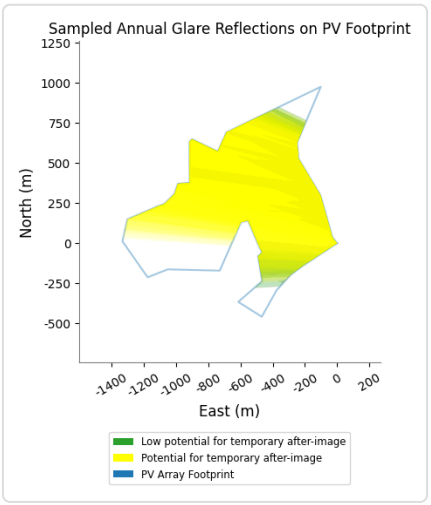
Green glare: 1,176 min.







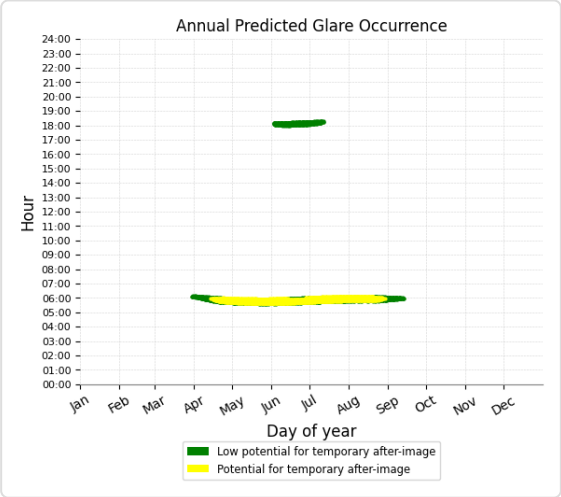


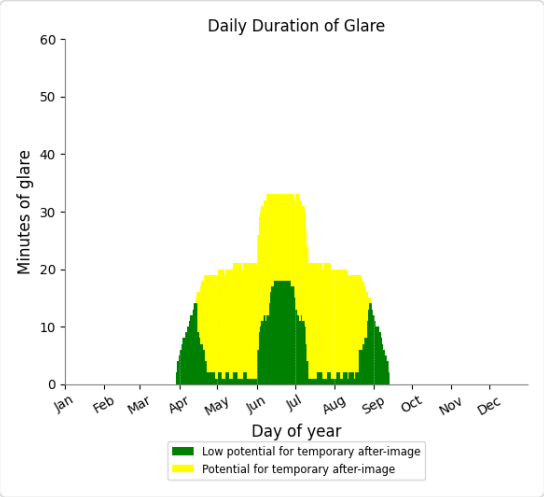


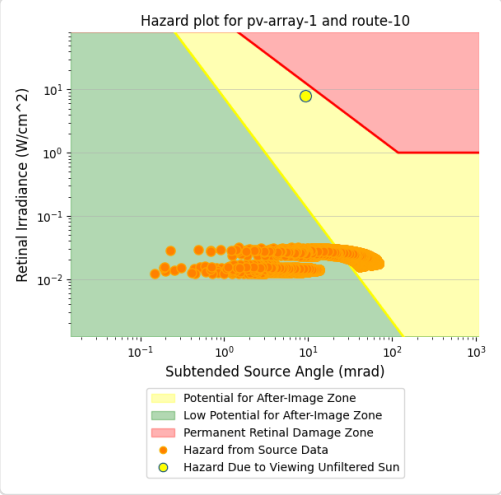
PV array 1 and Route: Route 10

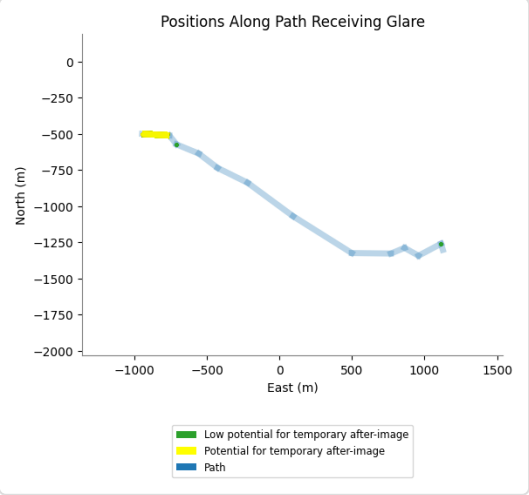
Yellow glare: 2,363 min.

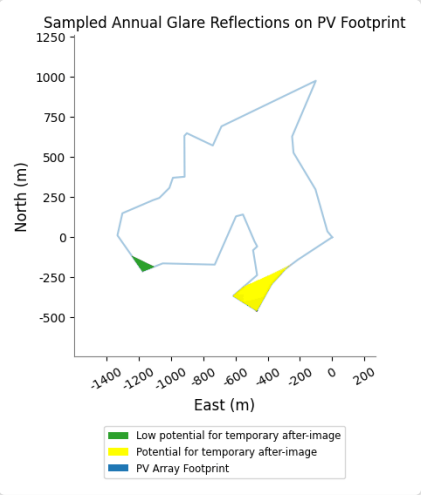
Green glare: 1,091 min.







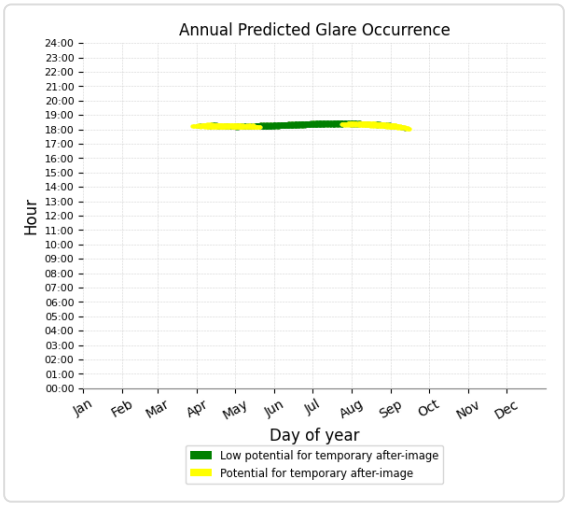


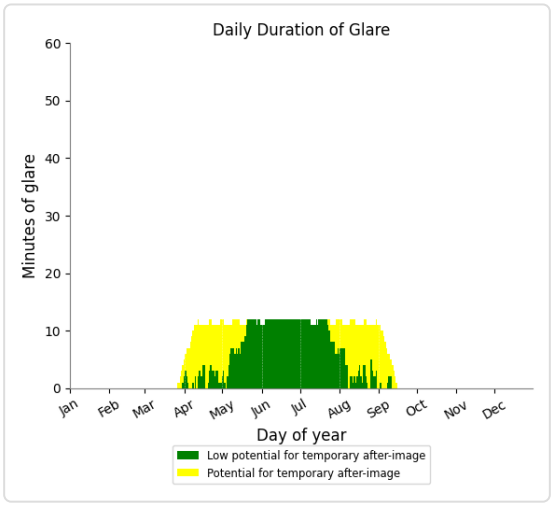


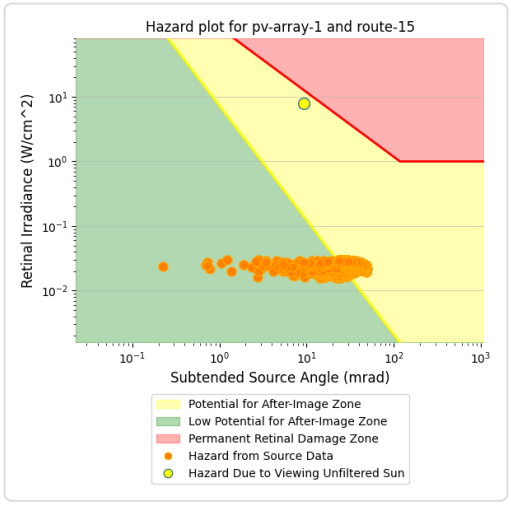
PV array 1 and Route: Route 15

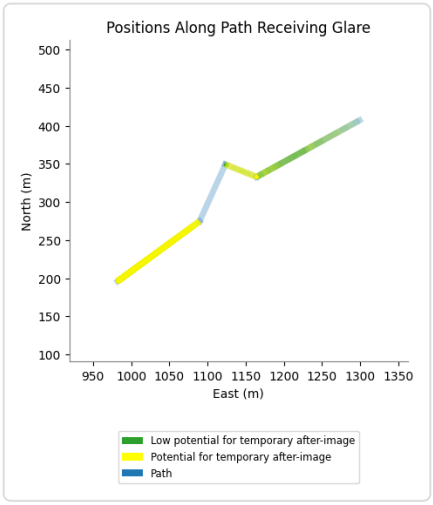
Yellow glare: 759 min.

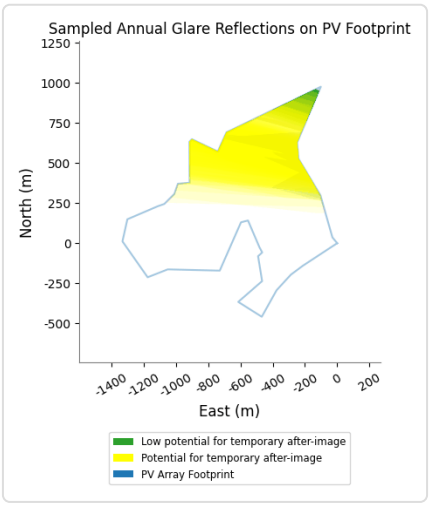
Green glare: 1,084 min.







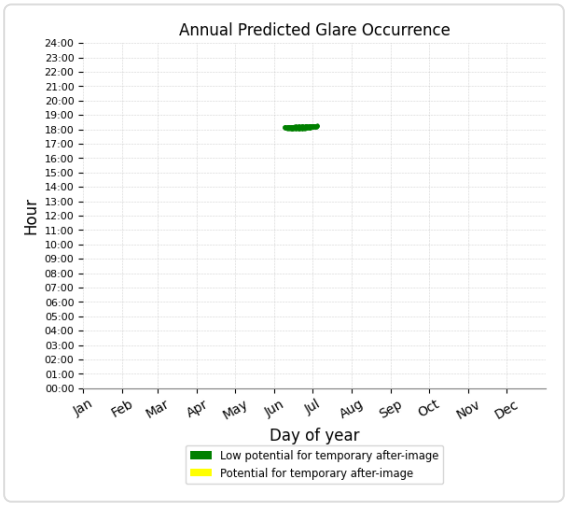


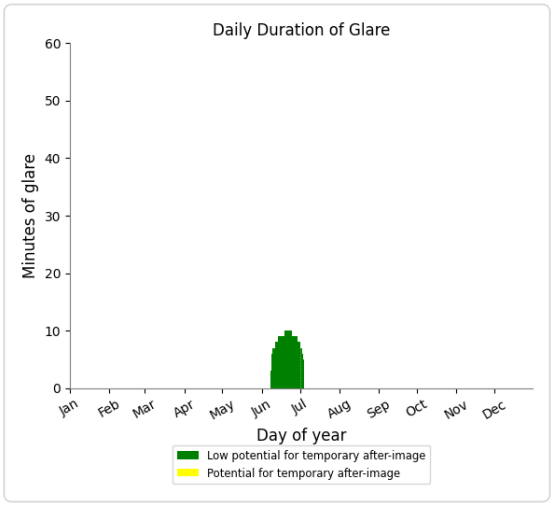


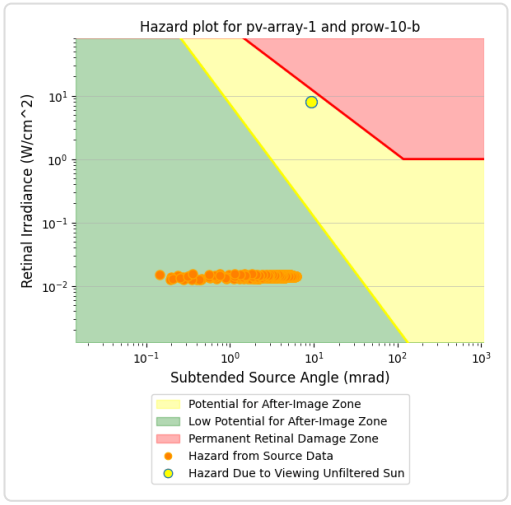
PV array 1 and Route: PRoW 12

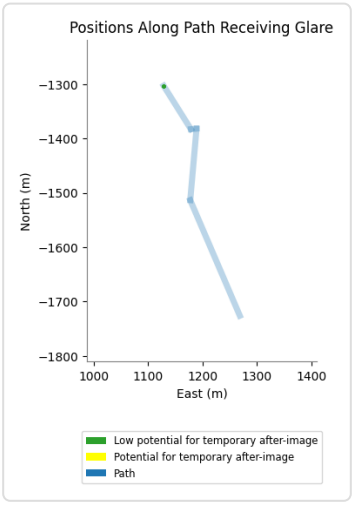
Yellow glare: none

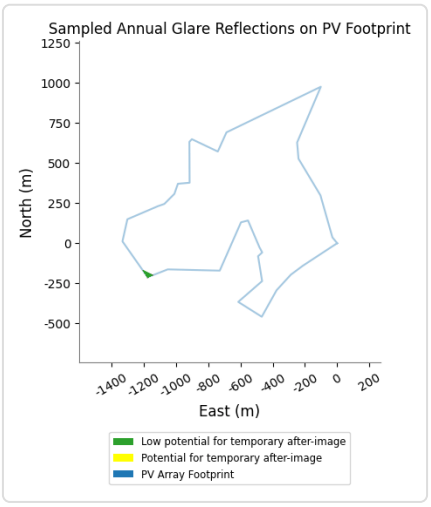
Green glare: 223 min.







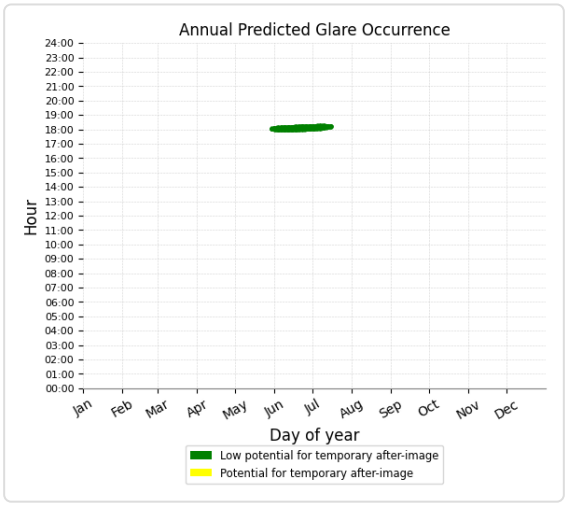


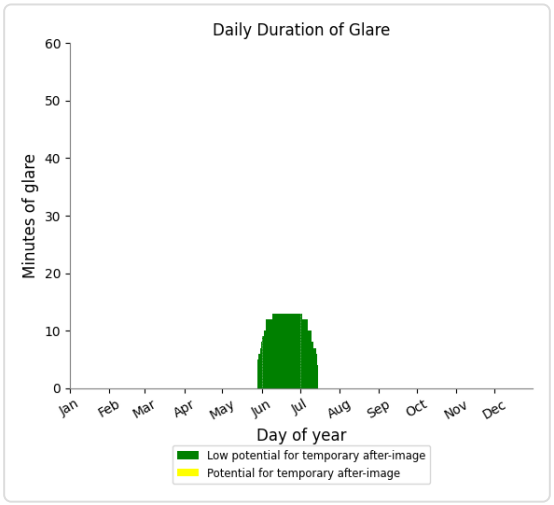


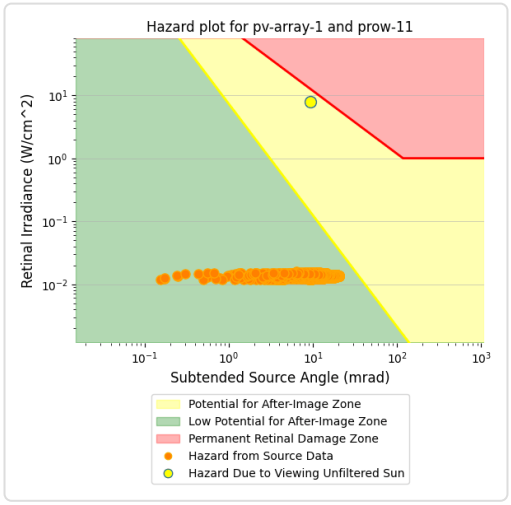
PV array 1 and Route: PRoW 11

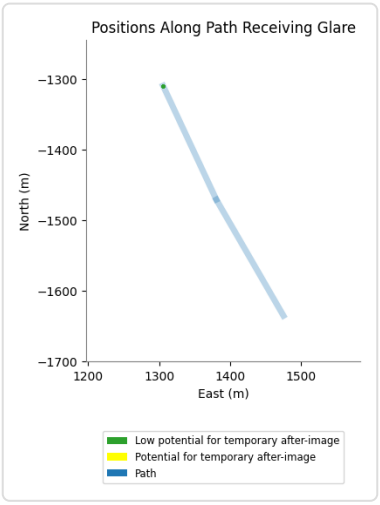
Yellow glare: none

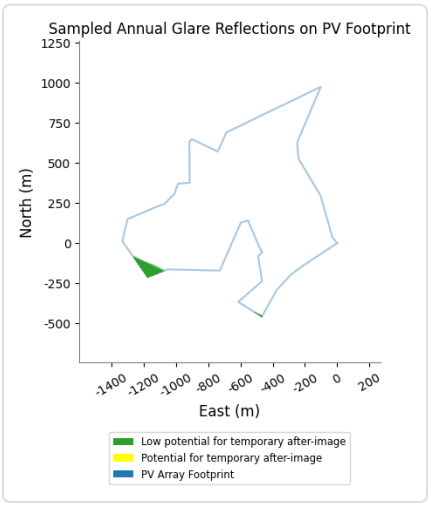
Green glare: 536 min.







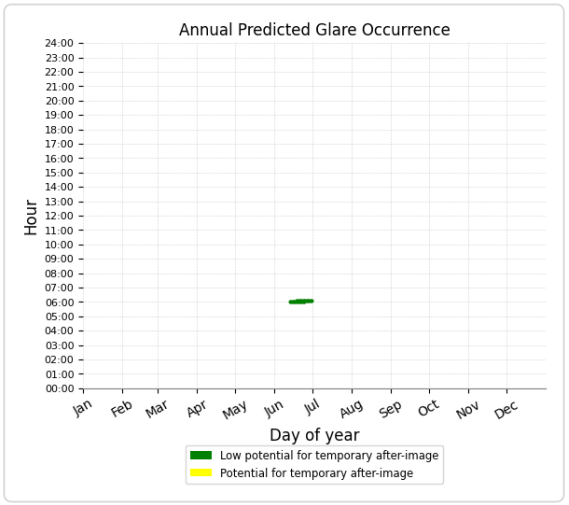


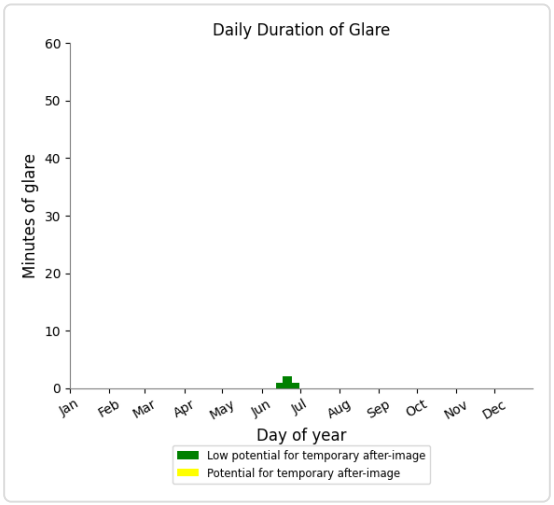


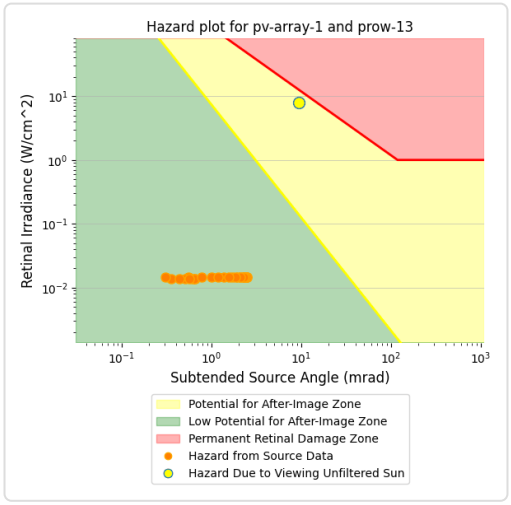
PV array 1 and Route: PRoW 13

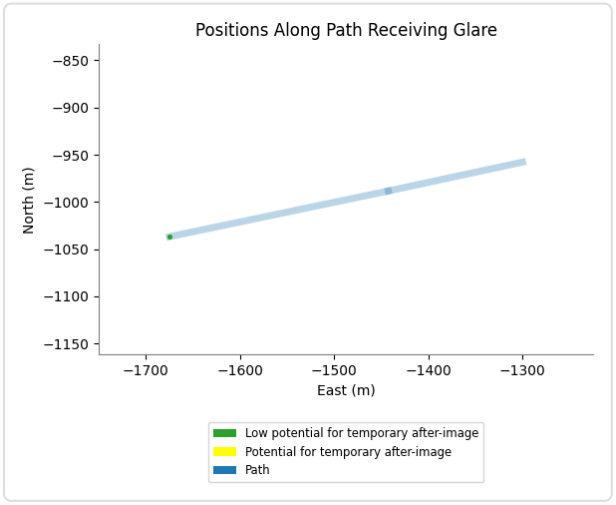
Yellow glare: none

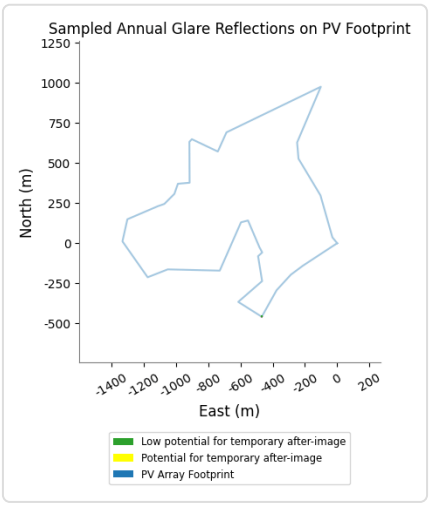
Green glare: 25 min.











PV array 1 and Route: PRoW 5

No glare found

PV array 1 and Route: PRoW 7

No glare found

PV: PV array 2 potential temporary after-image

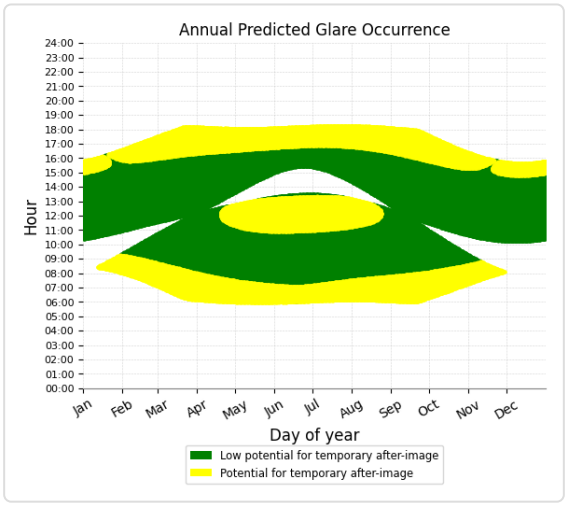
Receptor results ordered by category of glare

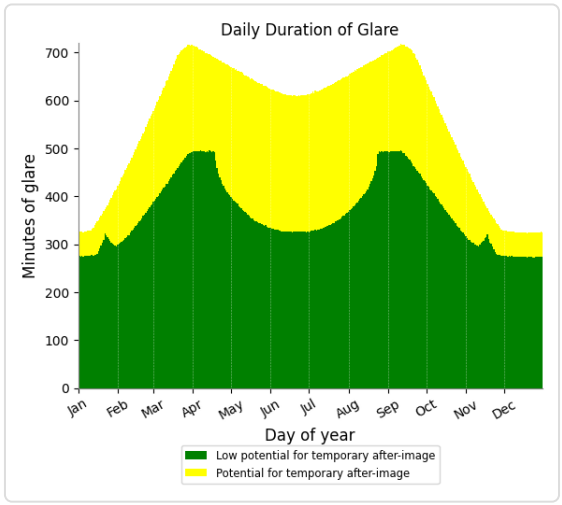
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	134,401	2,240.0	70,755	1,179.2
PRoW 12	917	15.3	3,103	51.7
PRoW 11	329	5.5	2,525	42.1
PRoW 13	352	5.9	1,985	33.1
PRoW 14	918	15.3	3,579	59.6
PRoW 2	133,059	2,217.7	50,896	848.3
PRoW 3	10,355	172.6	11,912	198.5
PRoW 4	1,403	23.4	1,774	29.6
PRoW 5	14	0.2	38	0.6
PRoW 6	2,079	34.6	1,038	17.3
PRoW 7	2,515	41.9	4,554	75.9
PRoW 8	719	12.0	5,628	93.8
PRoW 9	2,684	44.7	4,254	70.9
Route 10	128,993	2,149.9	49,788	829.8
Route 15	440	7.3	4,440	74.0

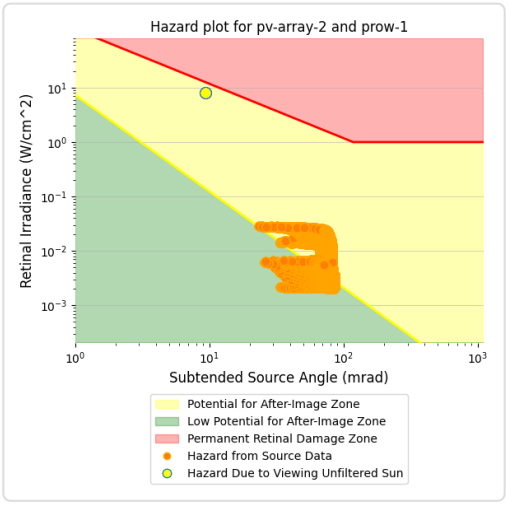
PV array 2 and Route: PRoW 1

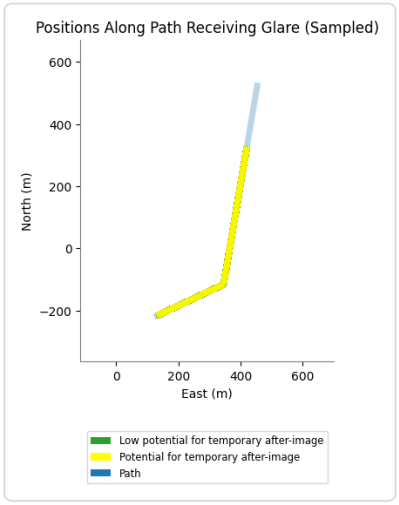
Yellow glare: 70,755 min.

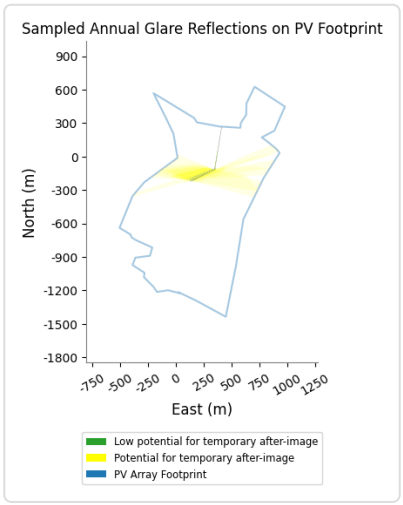
Green glare: 134,401 min.







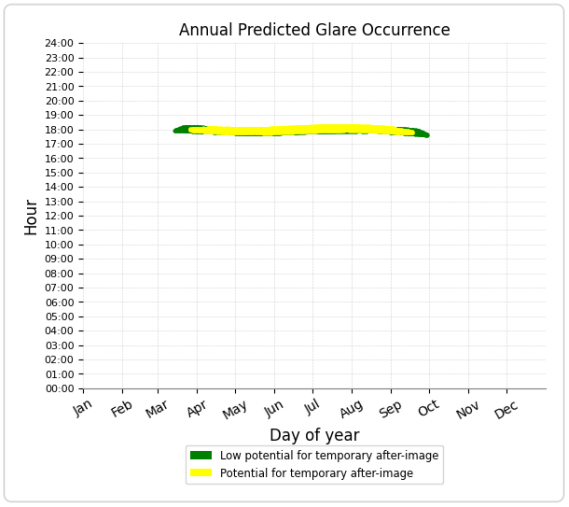


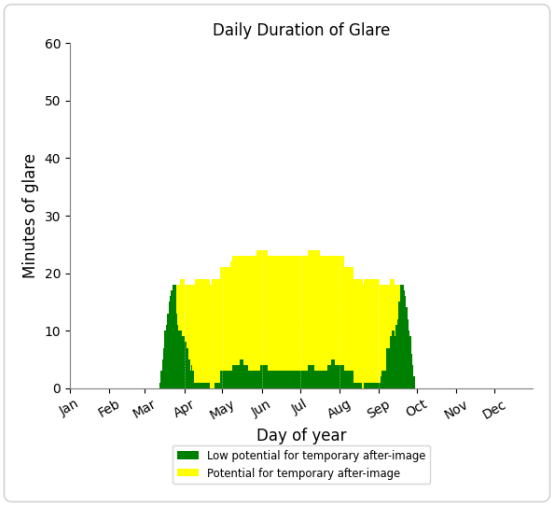


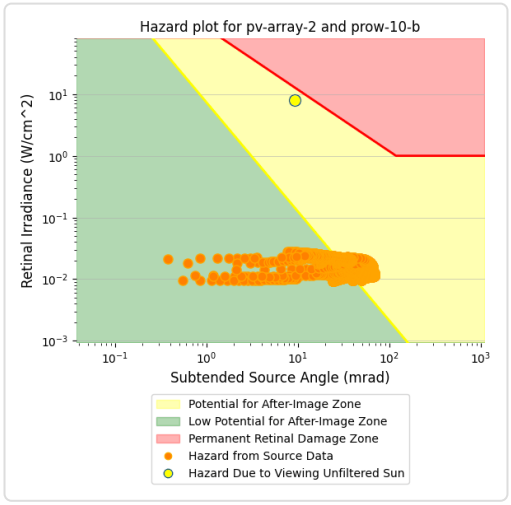
PV array 2 and Route: PRoW 12

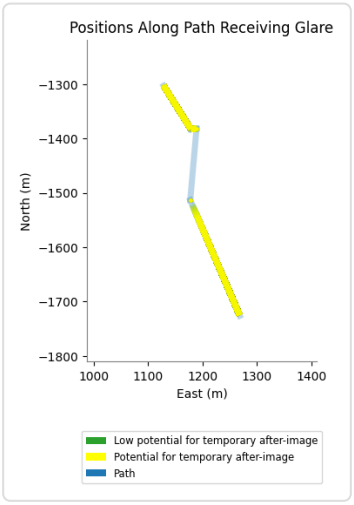
Yellow glare: 3,103 min.

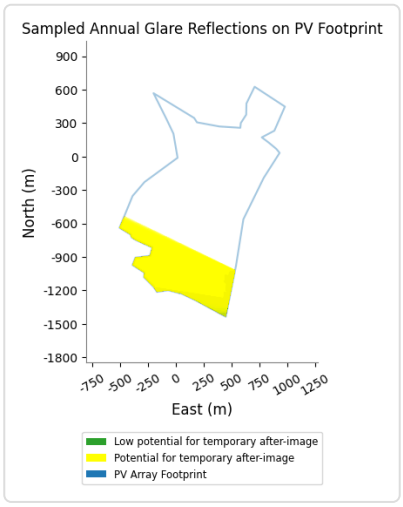
Green glare: 917 min.







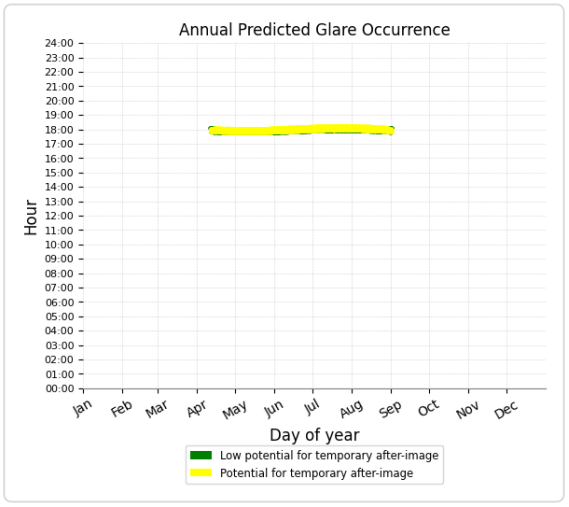


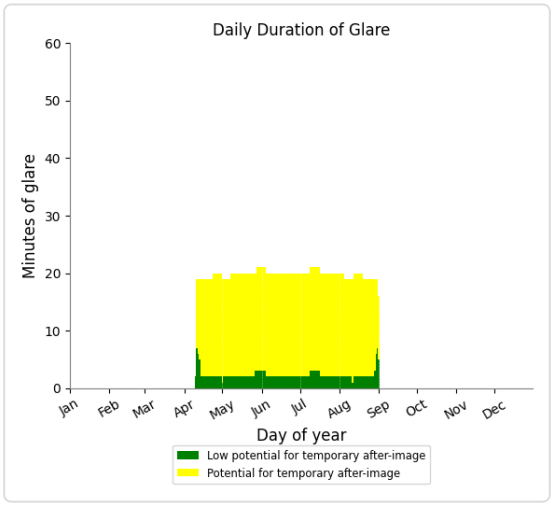


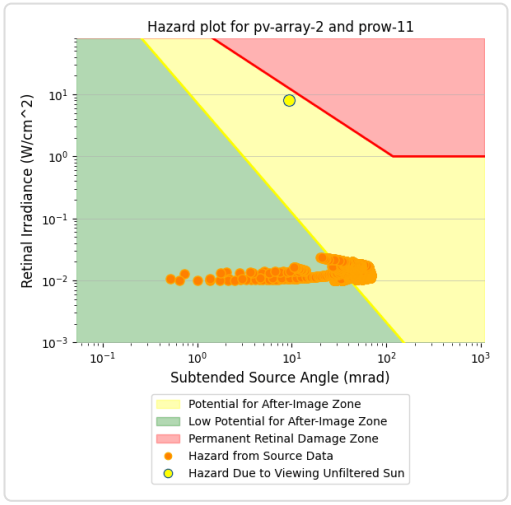
PV array 2 and Route: PRoW 11

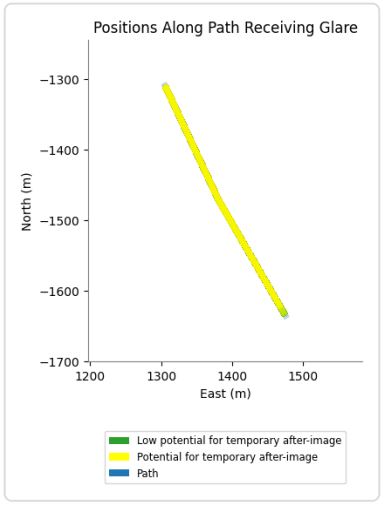
Yellow glare: 2,525 min.

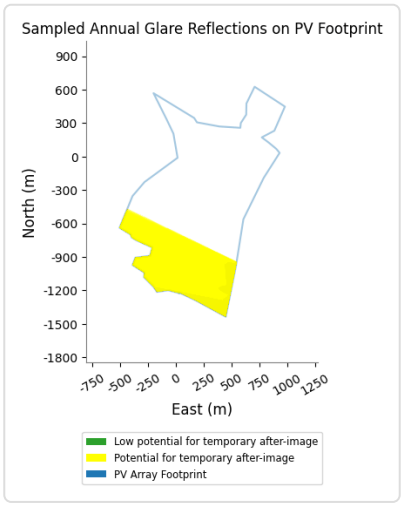
Green glare: 329 min.







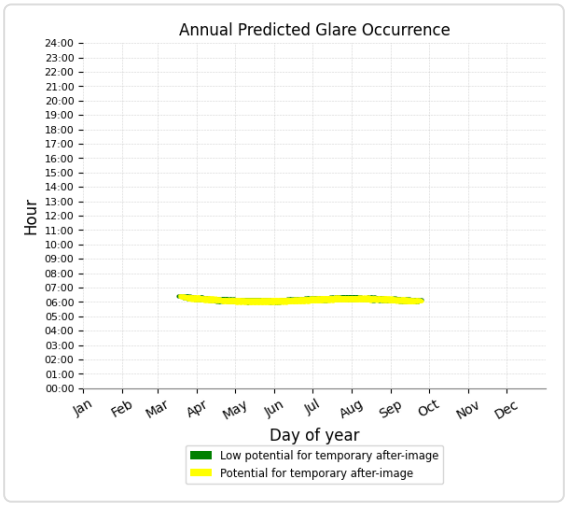


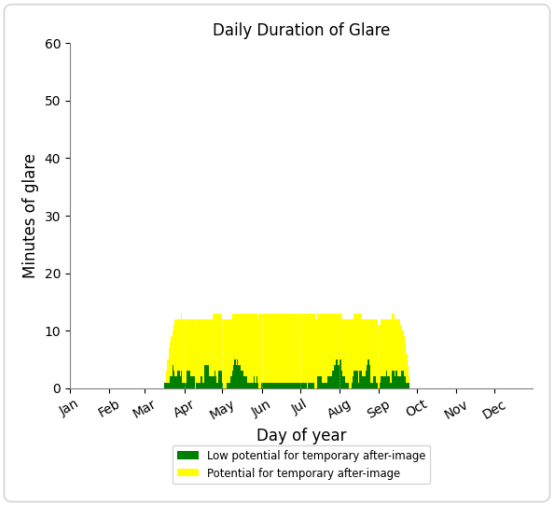


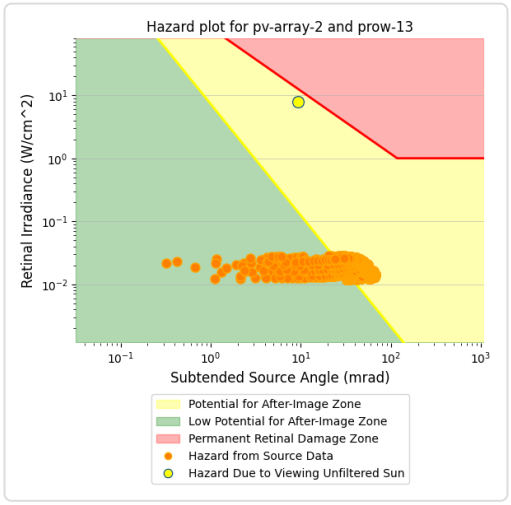
PV array 2 and Route: PRoW 13

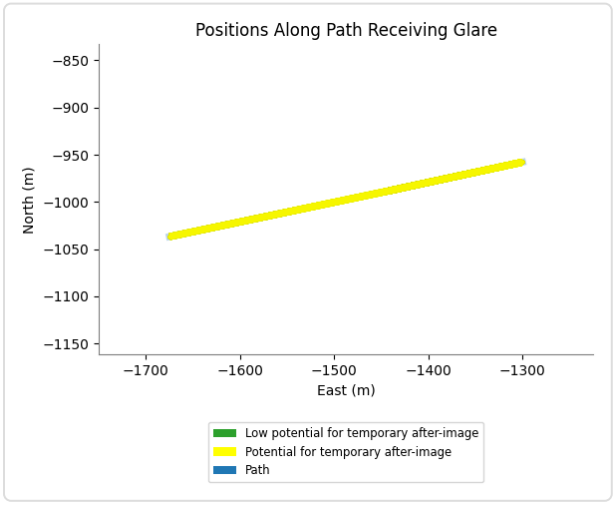
Yellow glare: 1,985 min.

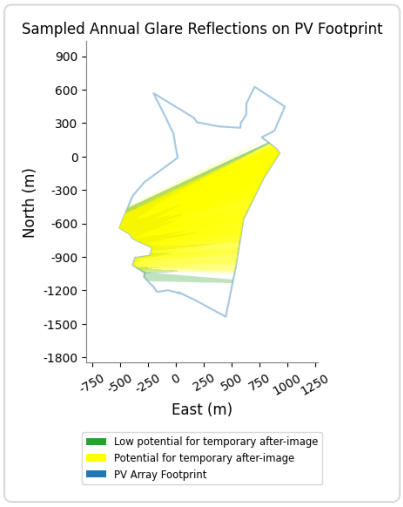
Green glare: 352 min.







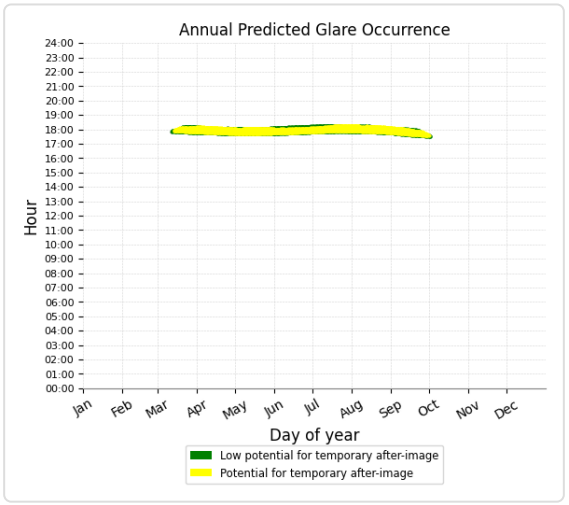


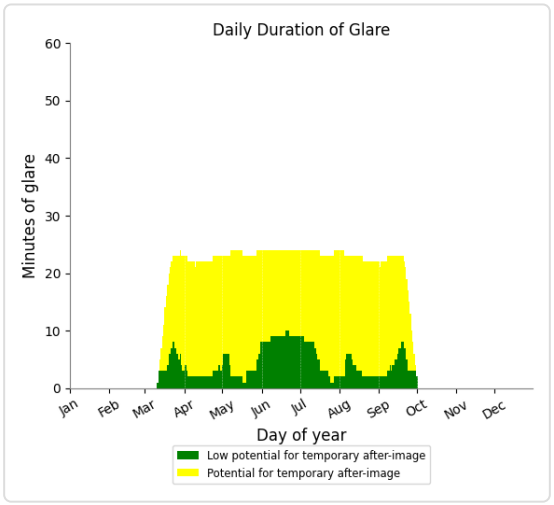


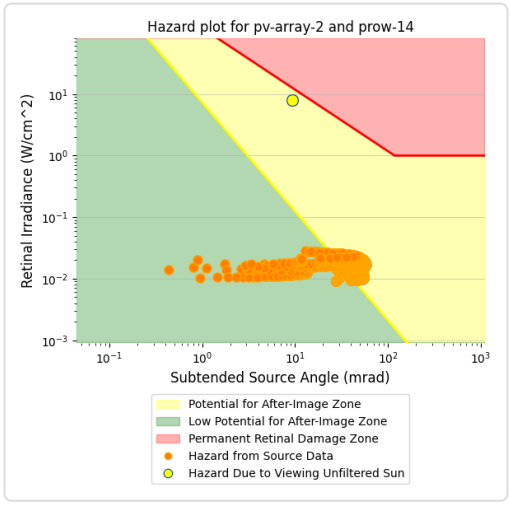
PV array 2 and Route: PRoW 14

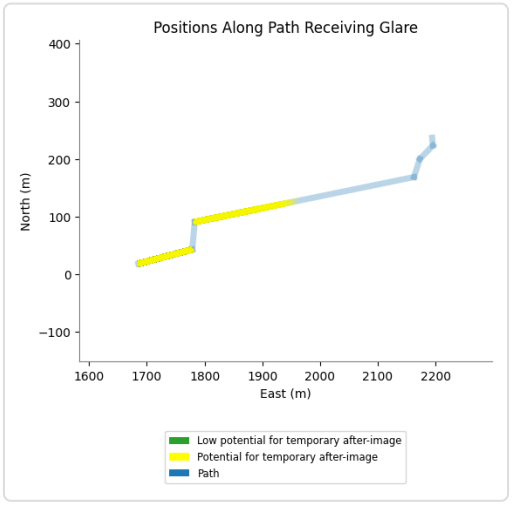
Yellow glare: 3,579 min.

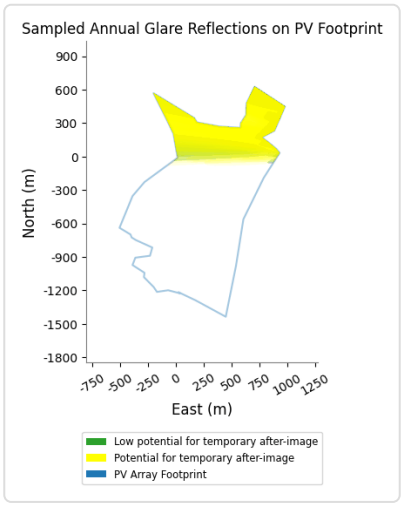
Green glare: 918 min.







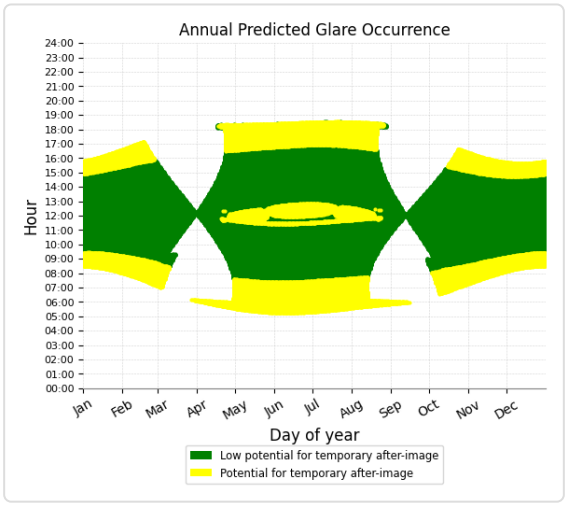


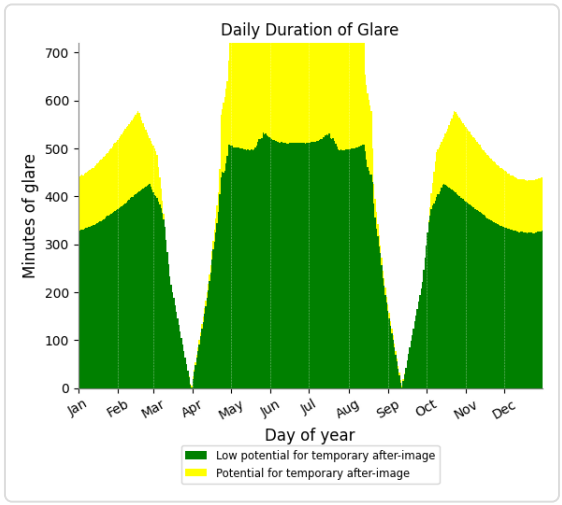


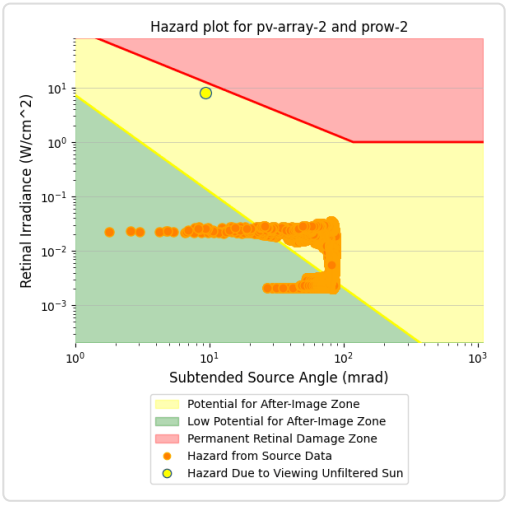
PV array 2 and Route: PRoW 2

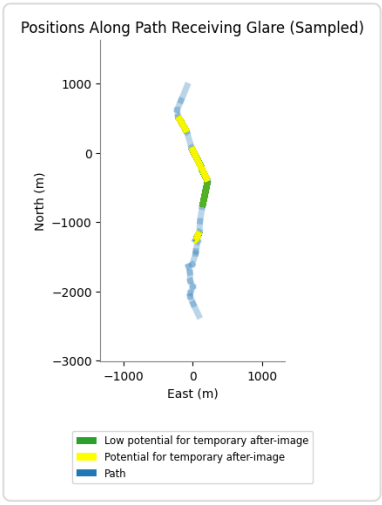
Yellow glare: 50,896 min.

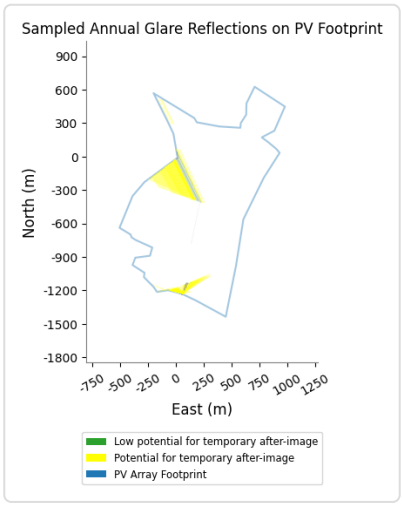
Green glare: 133,059 min.







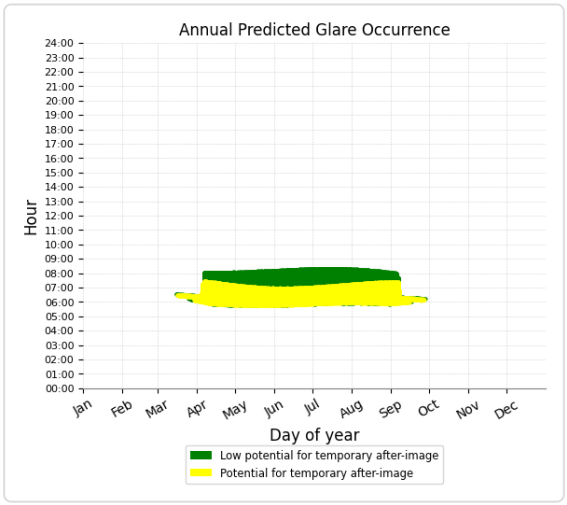


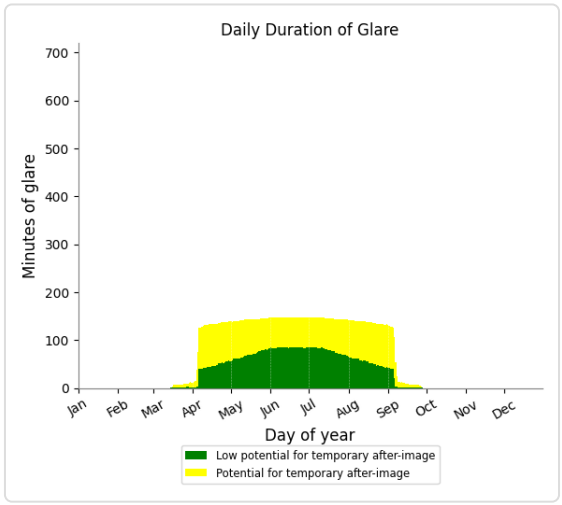


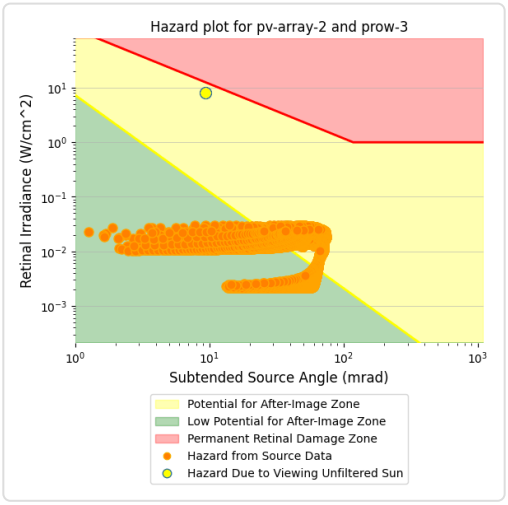
PV array 2 and Route: PRoW 3

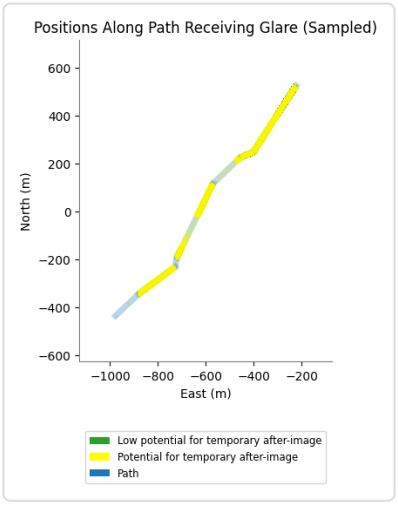
Yellow glare: 11,912 min.

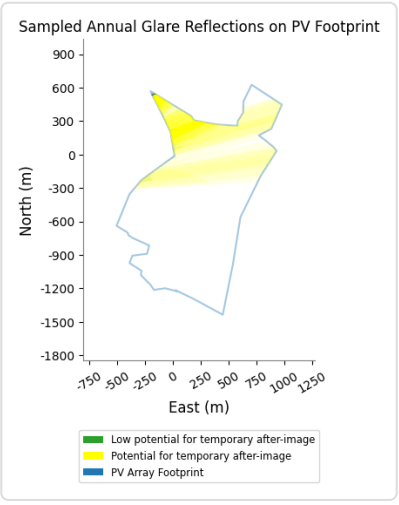
Green glare: 10,355 min.







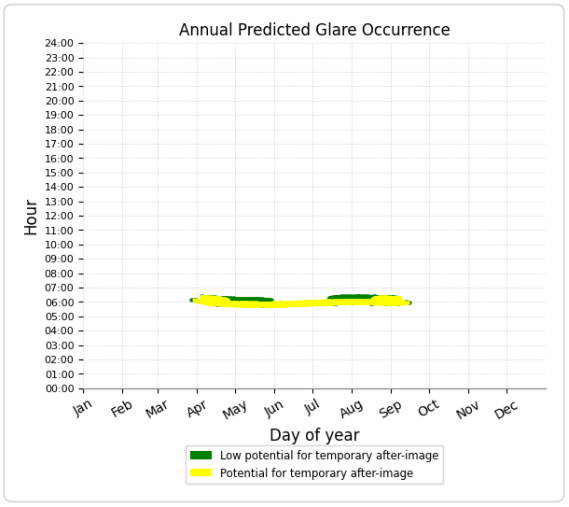


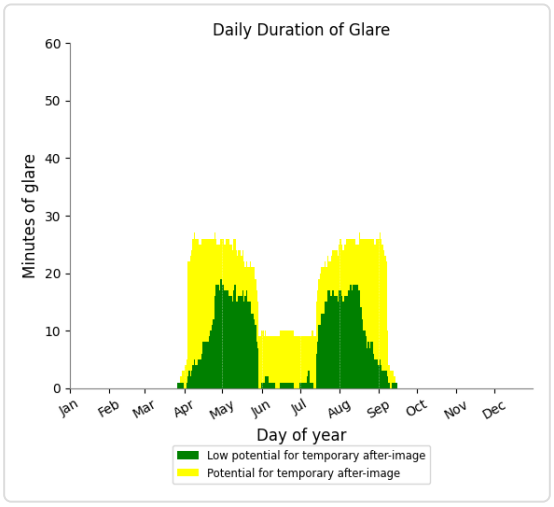


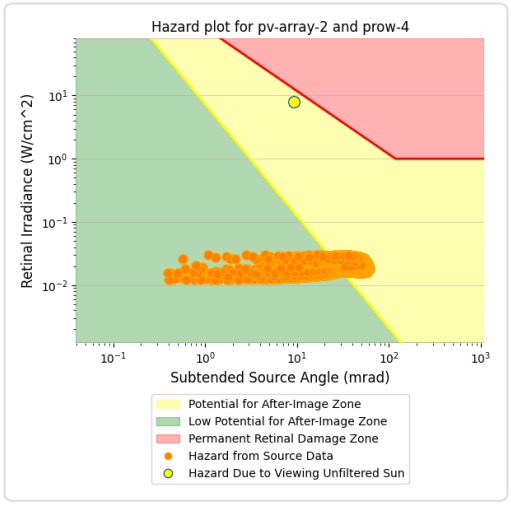
PV array 2 and Route: PRoW 4

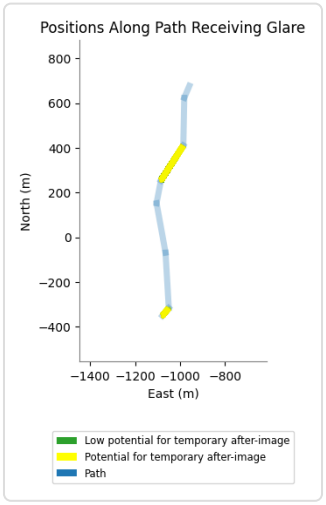
Yellow glare: 1,774 min.

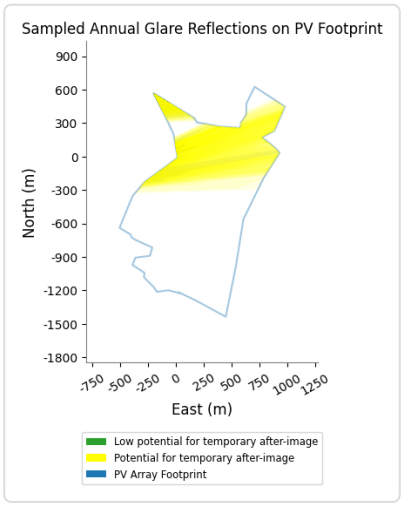
Green glare: 1,403 min.







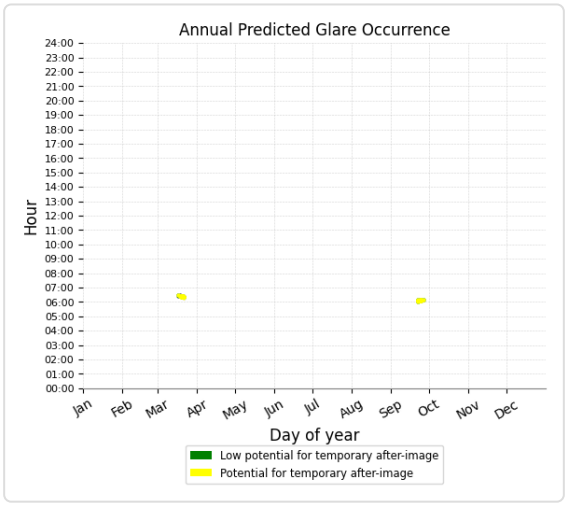


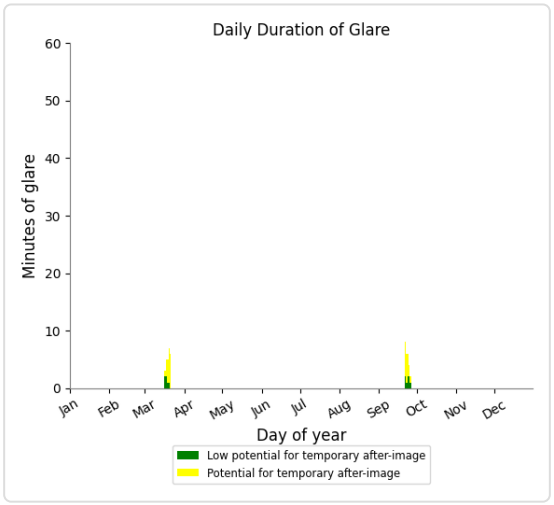


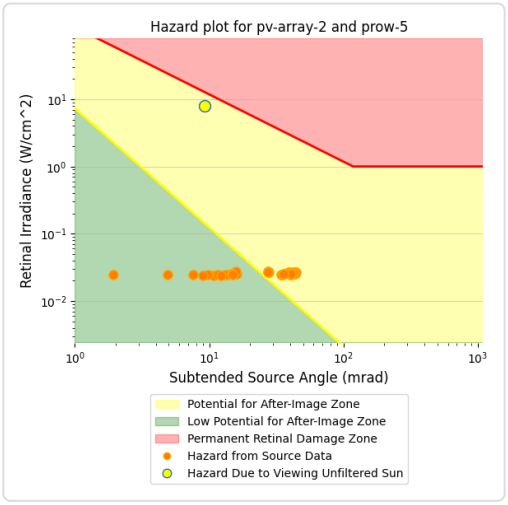
PV array 2 and Route: PRoW 5

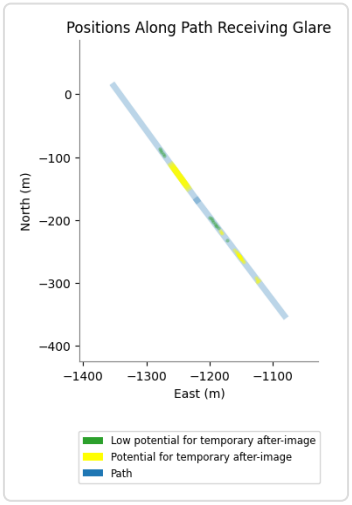
Yellow glare: 38 min.

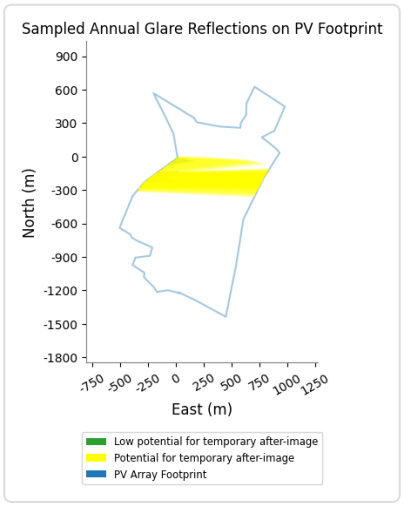
Green glare: 14 min.







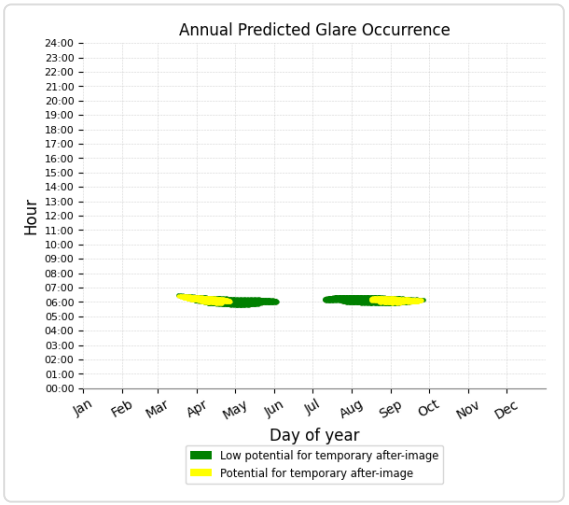


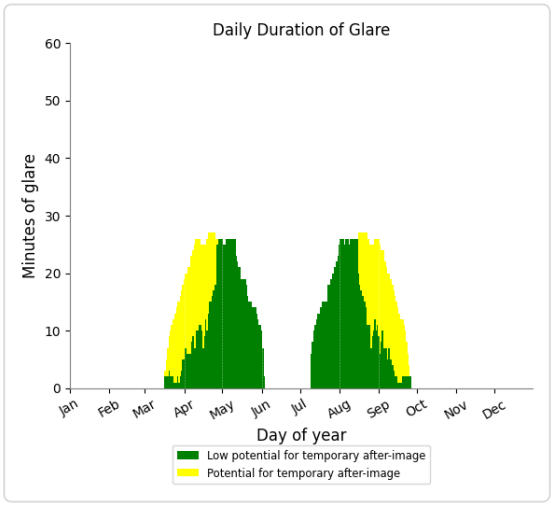


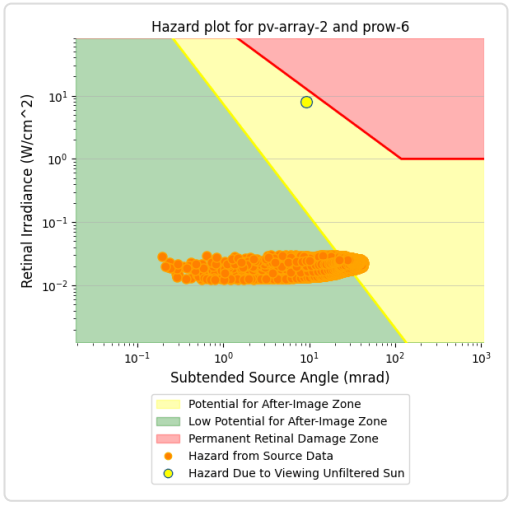
PV array 2 and Route: PRoW 6

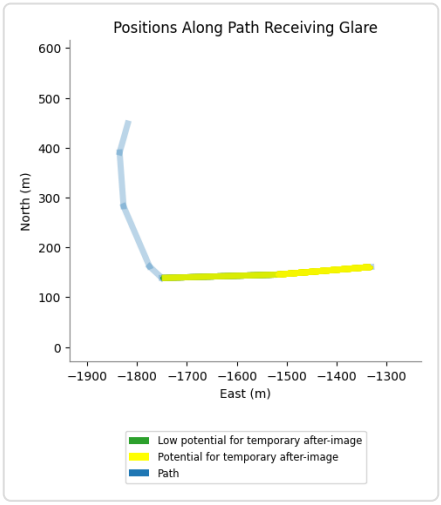
Yellow glare: 1,038 min.

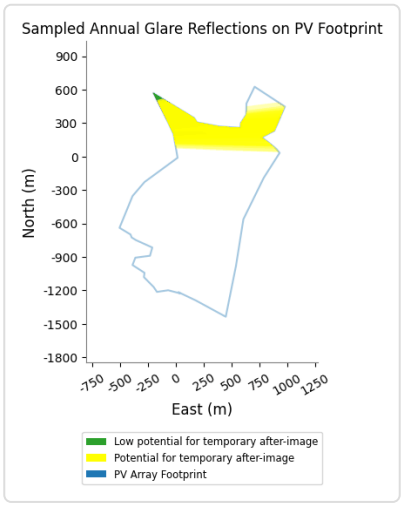
Green glare: 2,079 min.







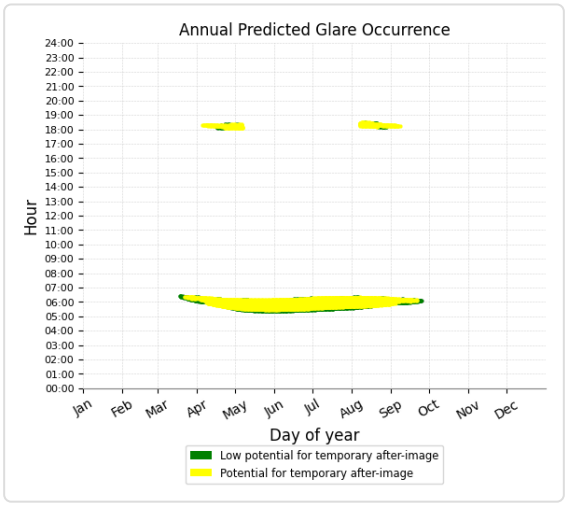


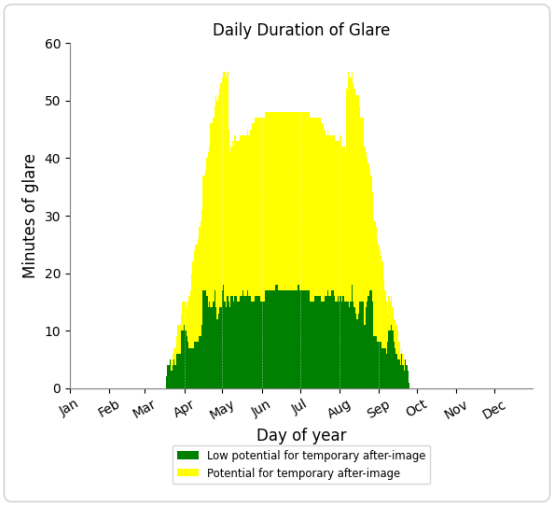


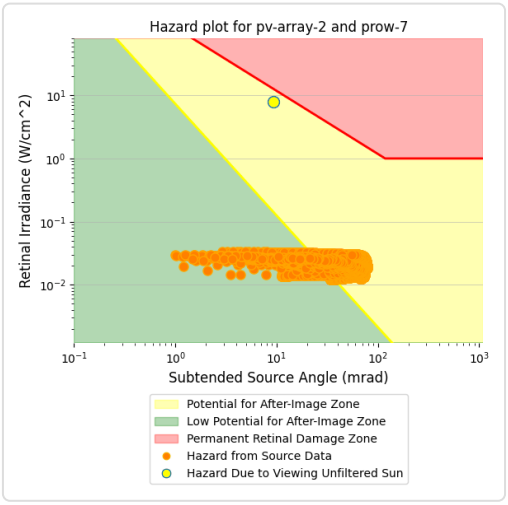
PV array 2 and Route: PRoW 7

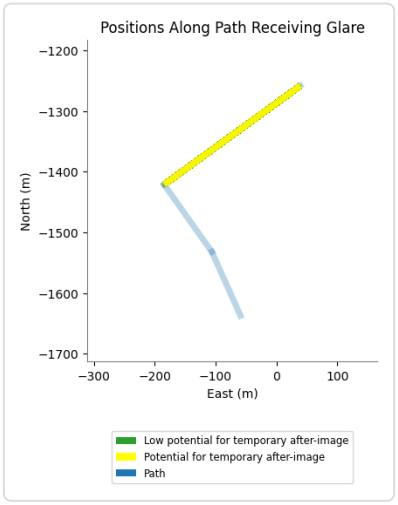
Yellow glare: 4,554 min.

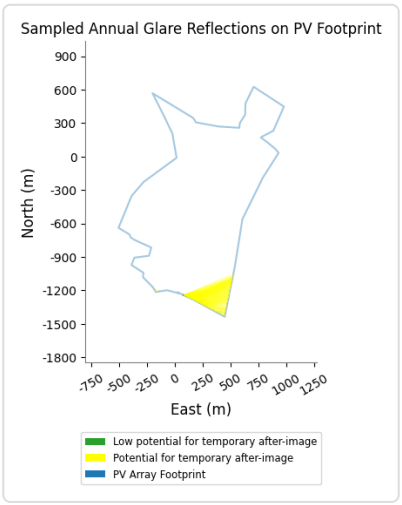
Green glare: 2,515 min.







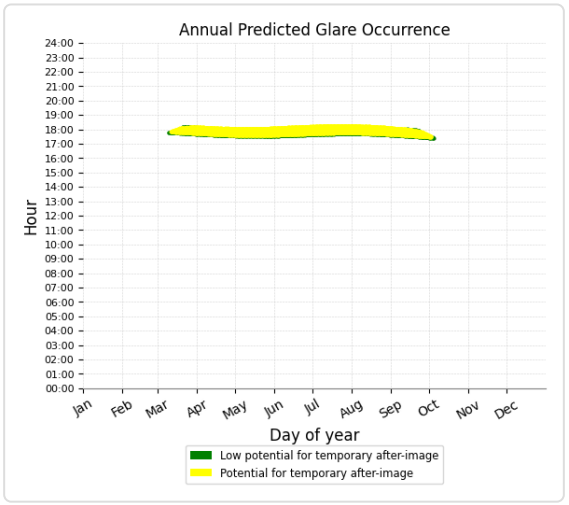


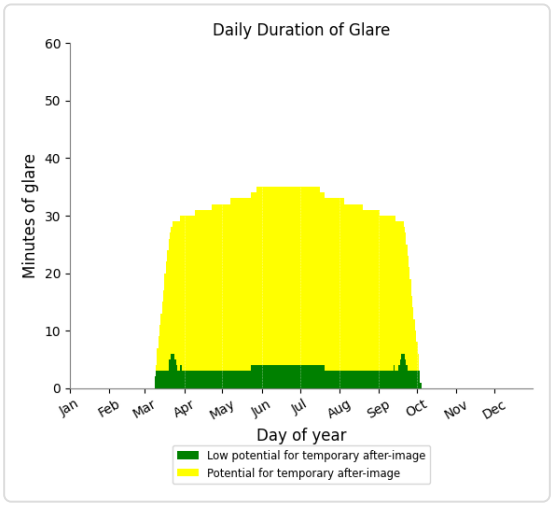


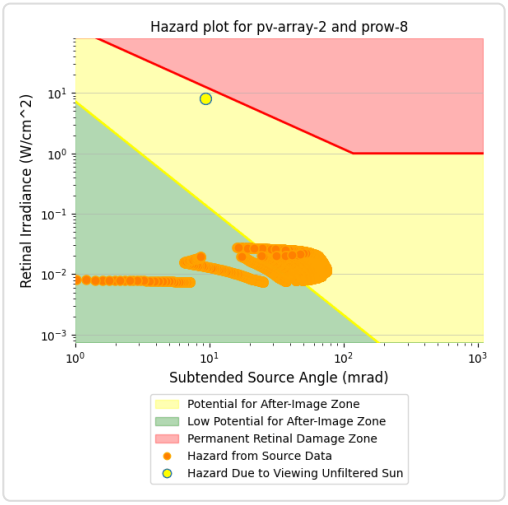
PV array 2 and Route: PRoW 8

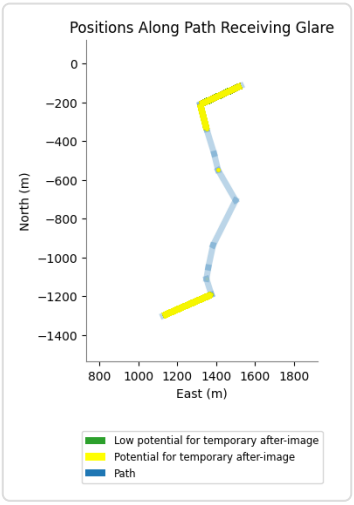
Yellow glare: 5,628 min.

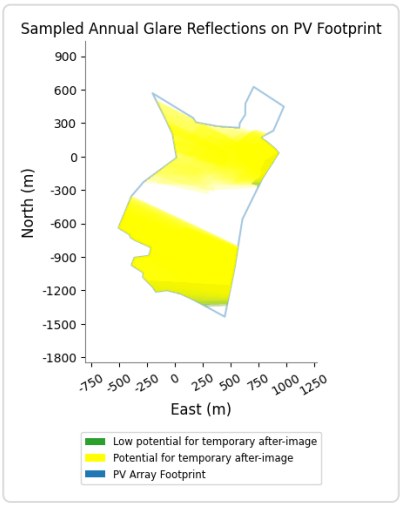
Green glare: 719 min.







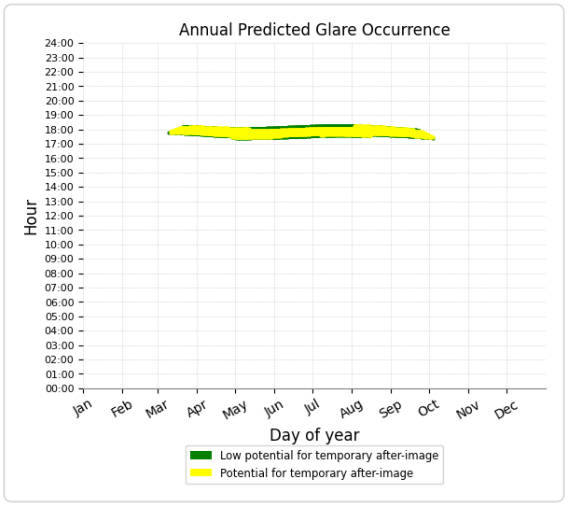


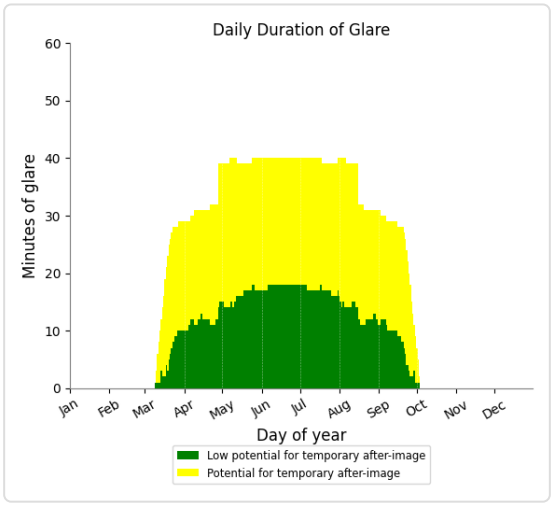


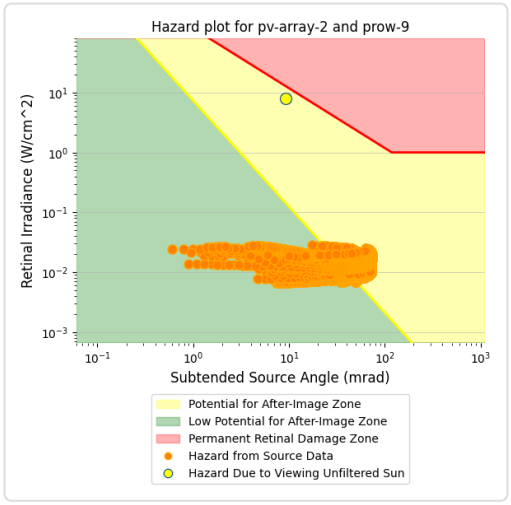
PV array 2 and Route: PRoW 9

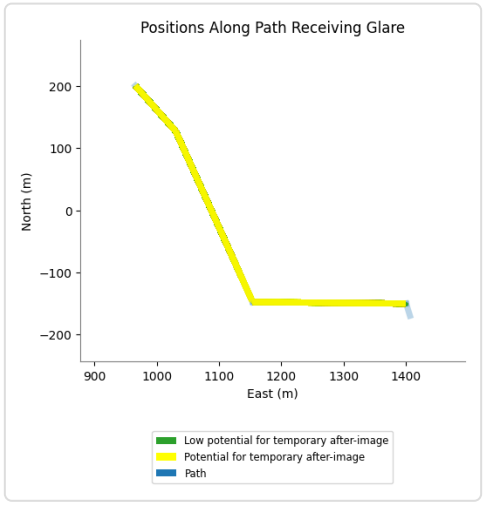
Yellow glare: 4,254 min.

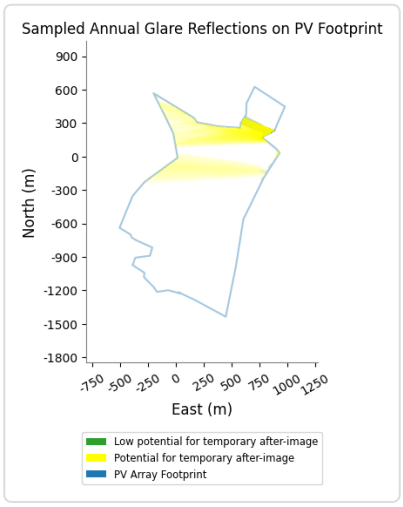
Green glare: 2,684 min.







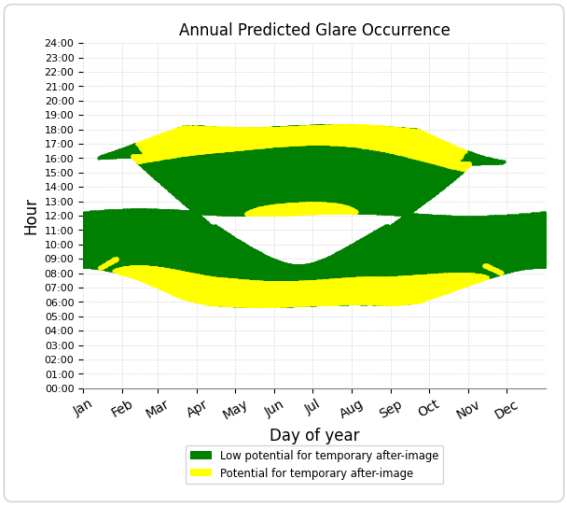


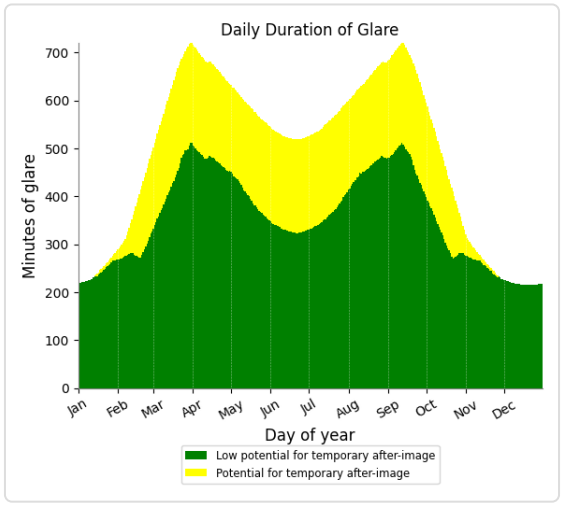


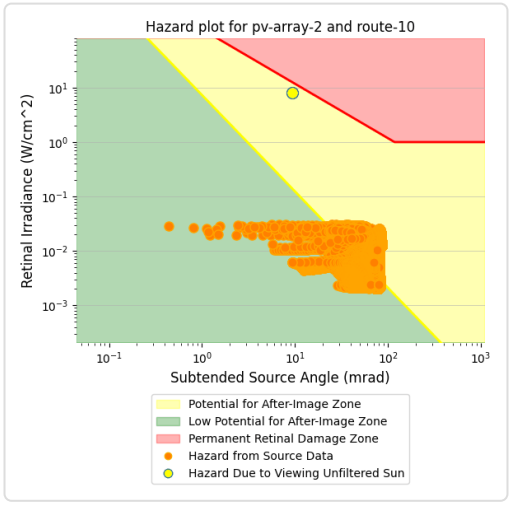
PV array 2 and Route: Route 10

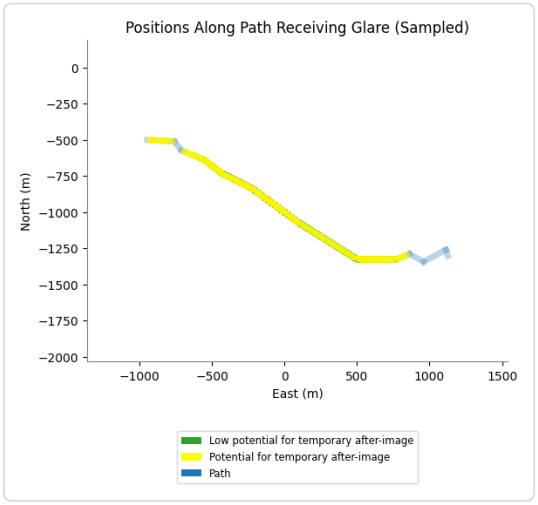
Yellow glare: 49,788 min.

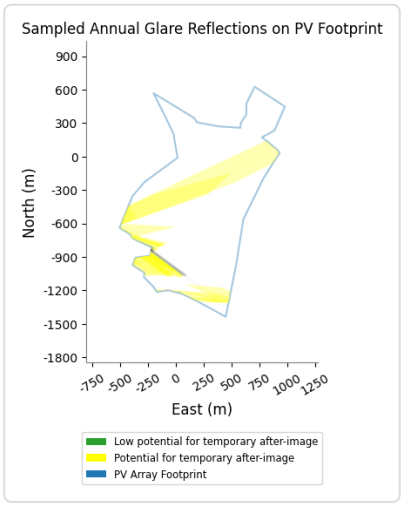
Green glare: 128,993 min.







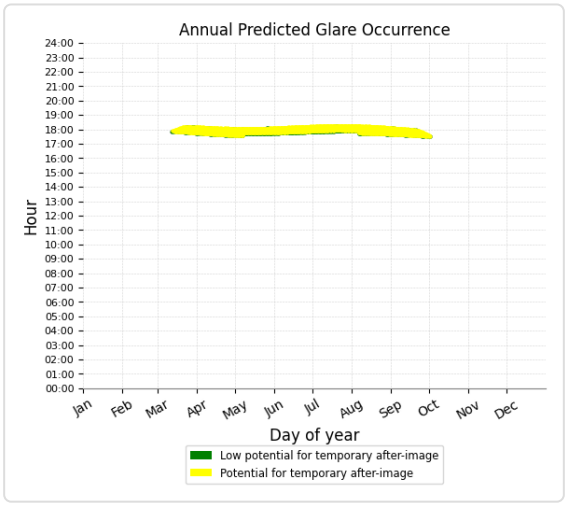


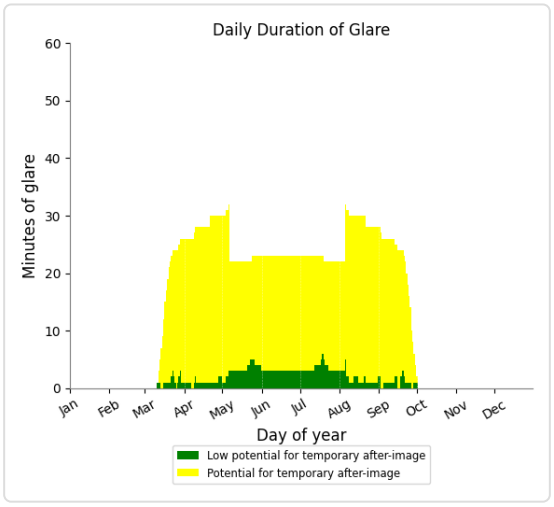


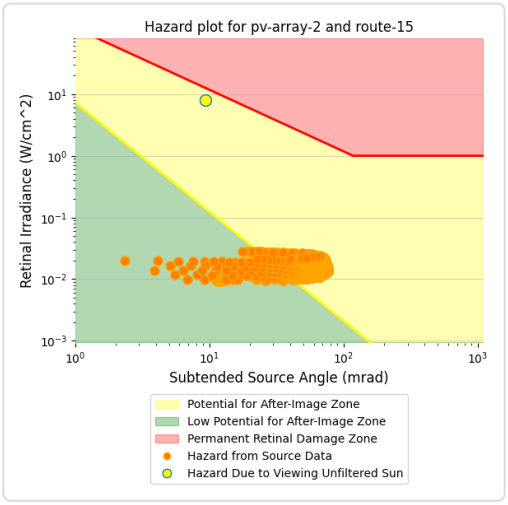
PV array 2 and Route: Route 15

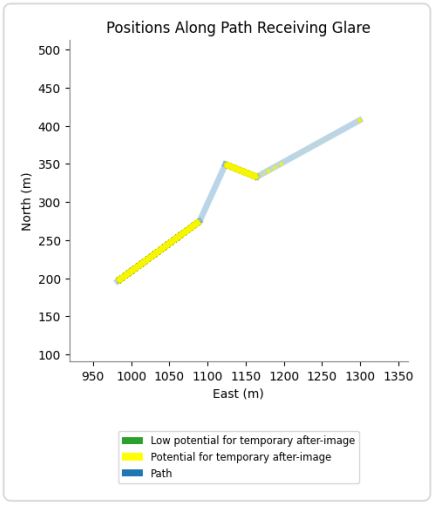
Yellow glare: 4,440 min.

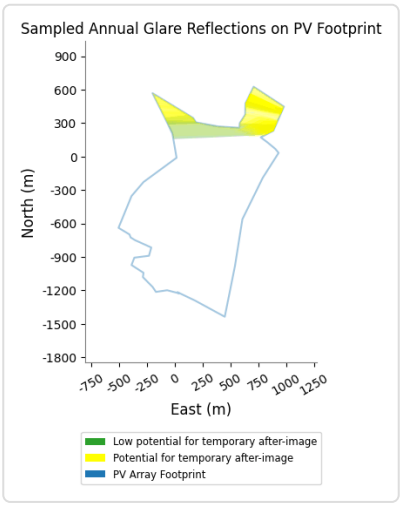
Green glare: 440 min.











PV: PV array 3 potential temporary after-image

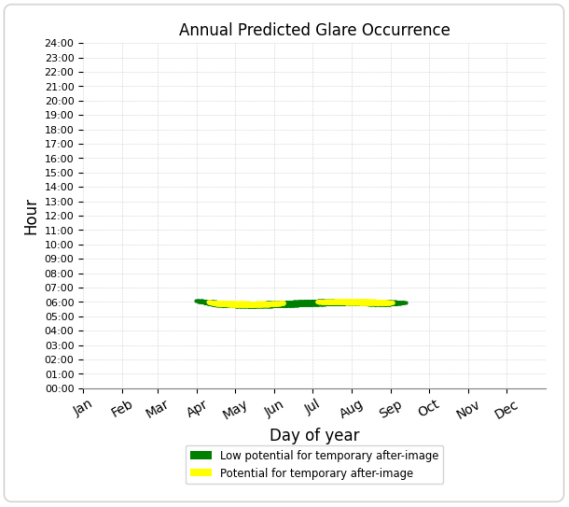
Receptor results ordered by category of glare

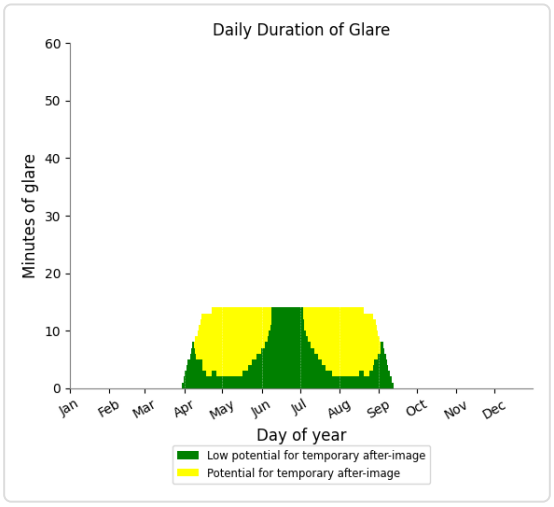
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	916	15.3	1,167	19.4
PRoW 14	453	7.5	2,666	44.4
PRoW 8	859	14.3	2,749	45.8
PRoW 9	1,405	23.4	1,913	31.9
Route 10	1,882	31.4	4	0.1
Route 15	507	8.4	1,877	31.3
PRoW 13	1,198	20.0	0	0.0
PRoW 3	1,422	23.7	0	0.0
PRoW 4	627	10.4	0	0.0
PRoW 6	305	5.1	0	0.0
PRoW 12	0	0.0	0	0.0
PRoW 11	0	0.0	0	0.0
PRoW 2	0	0.0	0	0.0
PRoW 5	0	0.0	0	0.0
PRoW 7	0	0.0	0	0.0

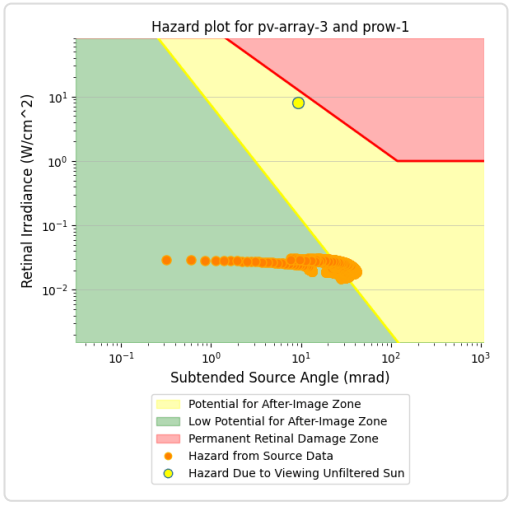
PV array 3 and Route: PRoW 1

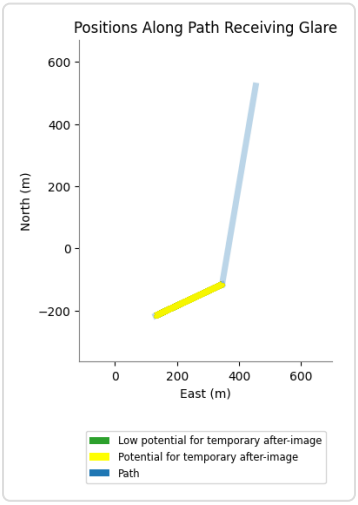
Yellow glare: 1,167 min.

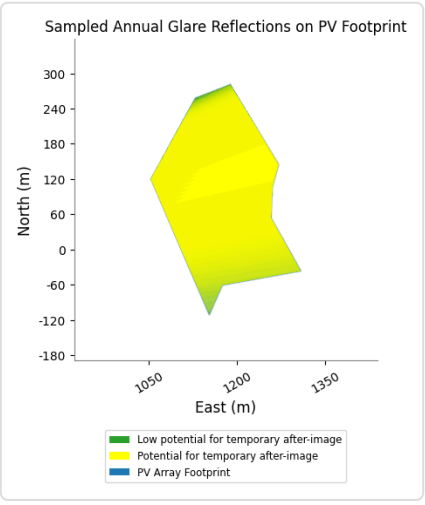
Green glare: 916 min.







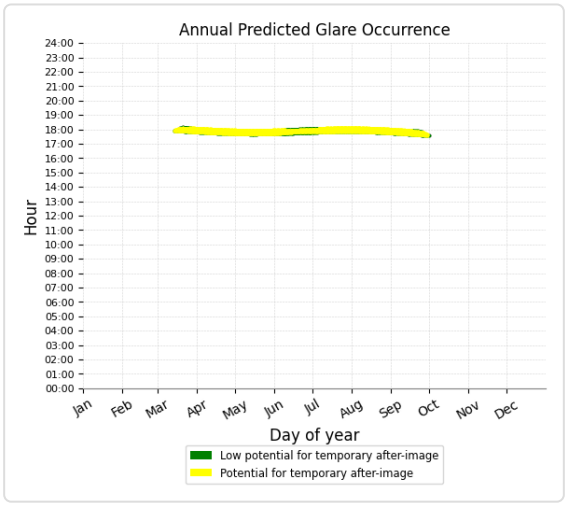


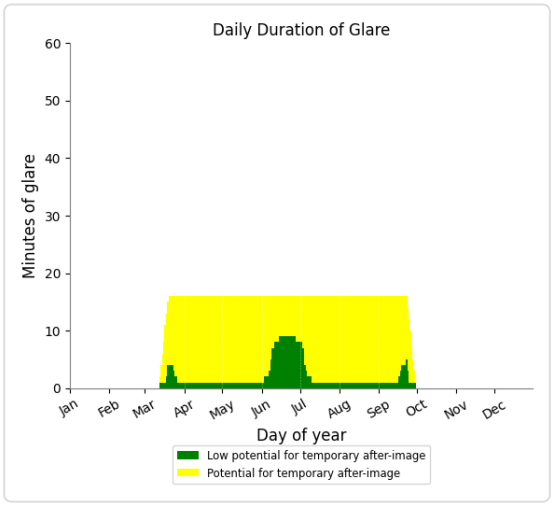


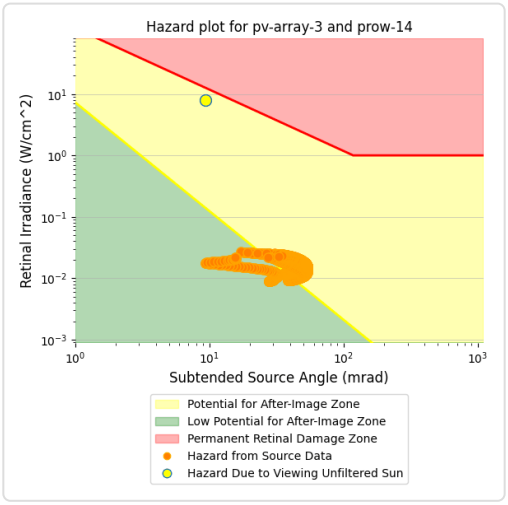
PV array 3 and Route: PRoW 14

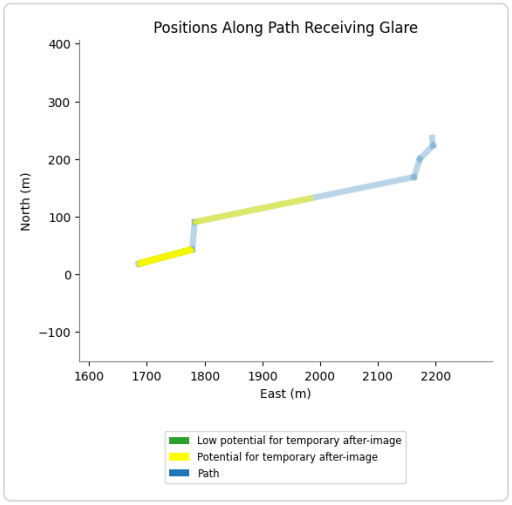
Yellow glare: 2,666 min.

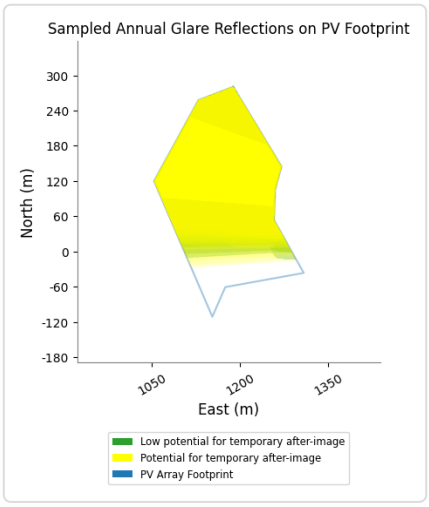
Green glare: 453 min.







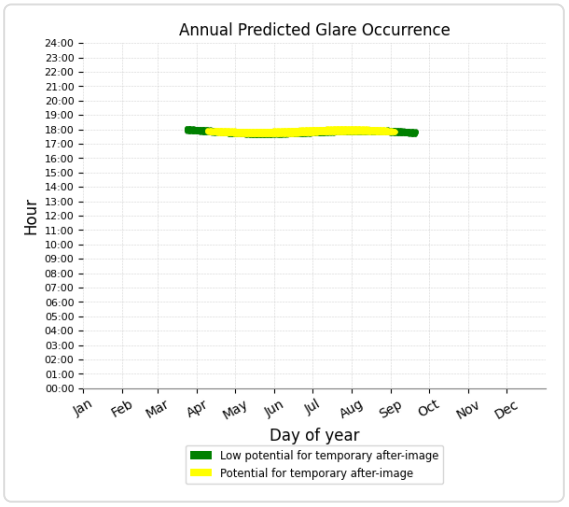


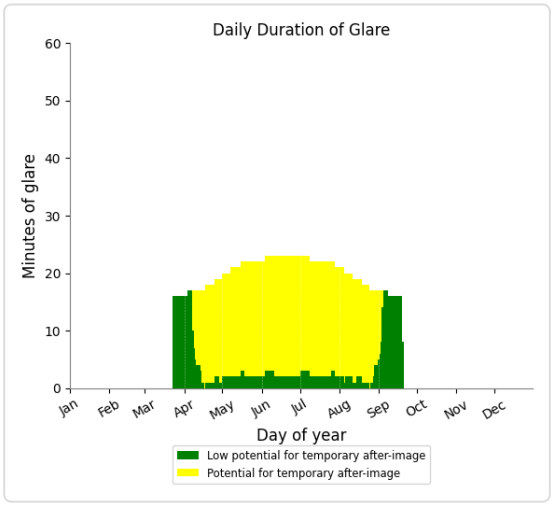


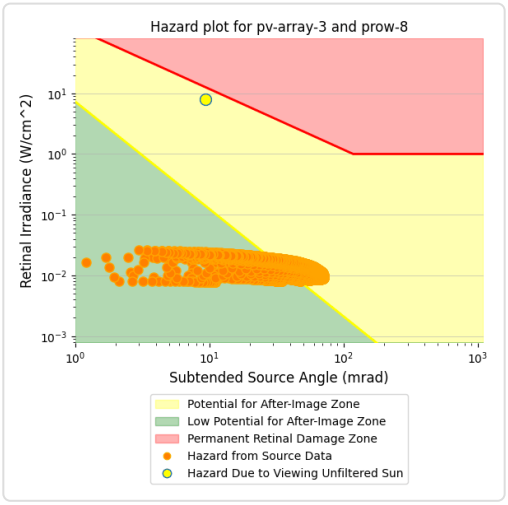
PV array 3 and Route: PRoW 8

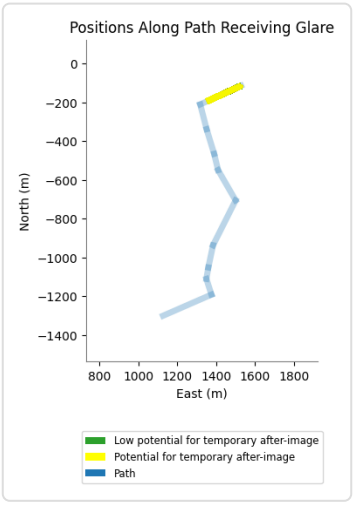
Yellow glare: 2,749 min.

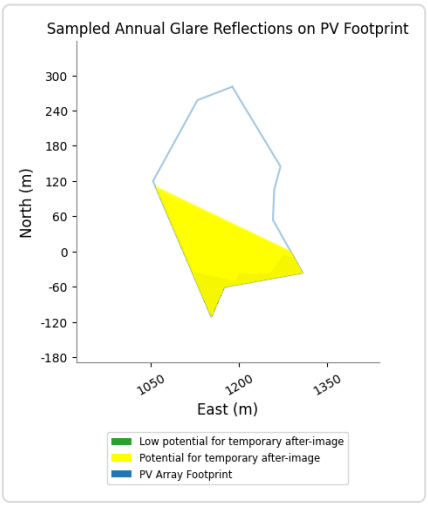
Green glare: 859 min.







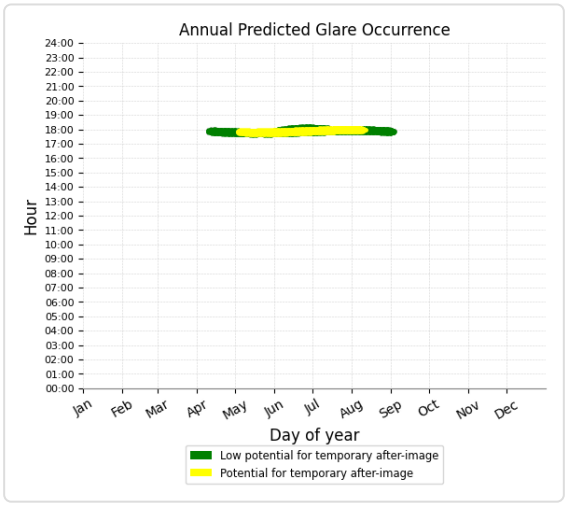


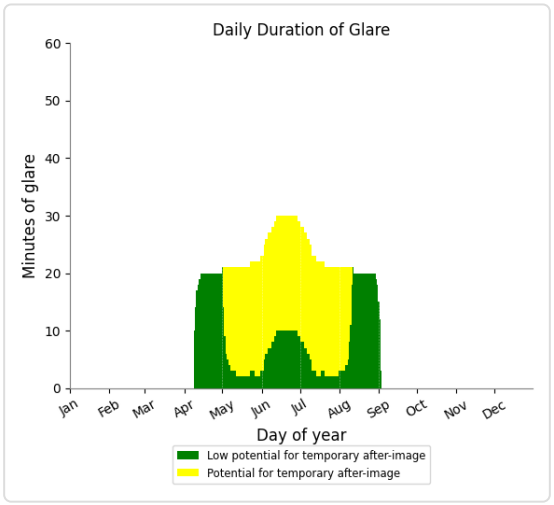


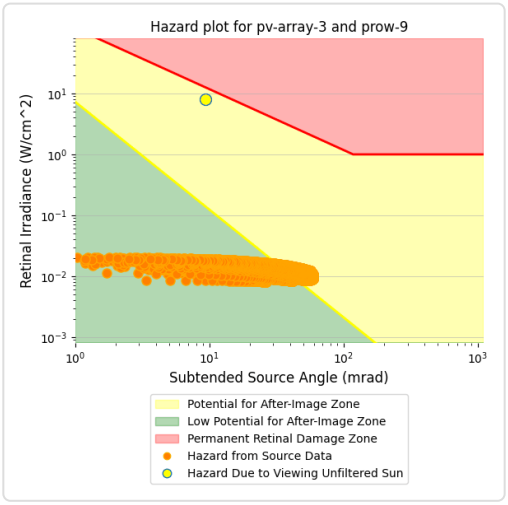
PV array 3 and Route: PRoW 9

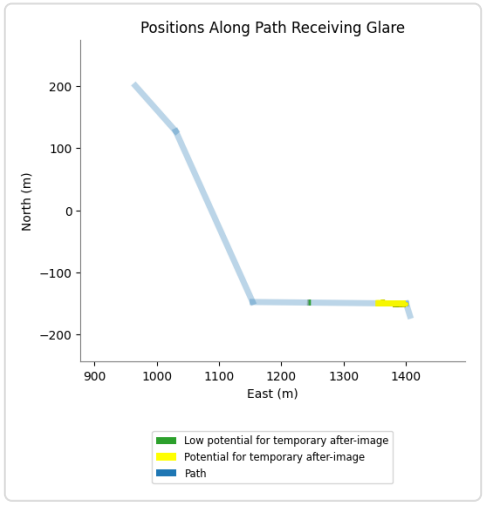
Yellow glare: 1,913 min.

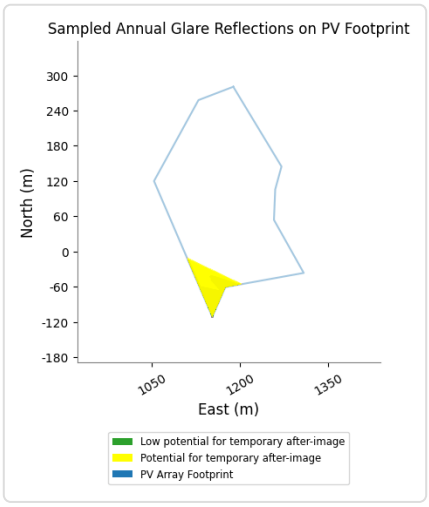
Green glare: 1,405 min.







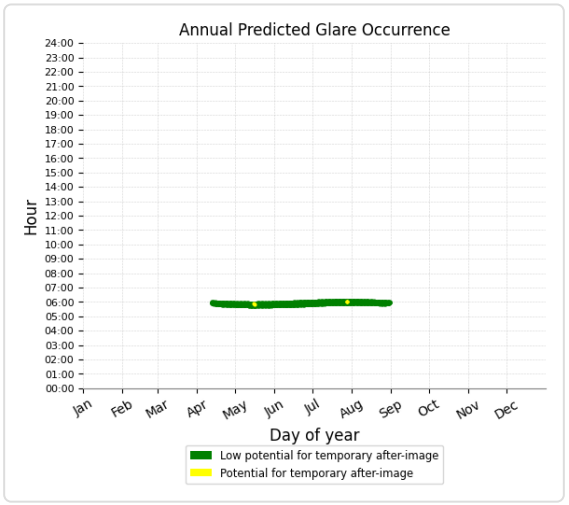


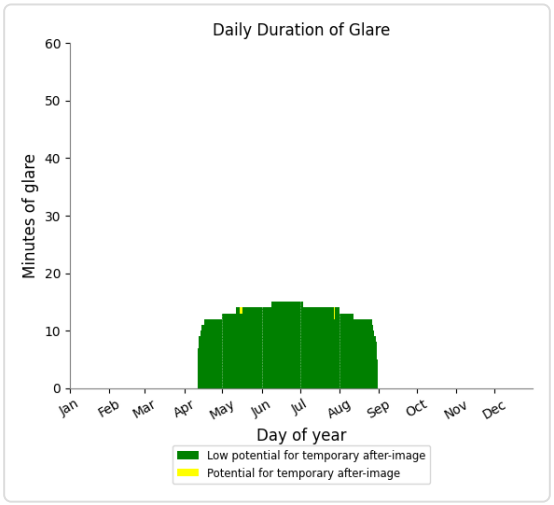


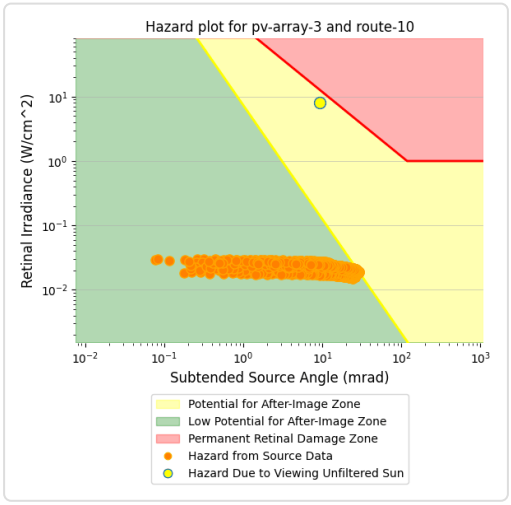
PV array 3 and Route: Route 10

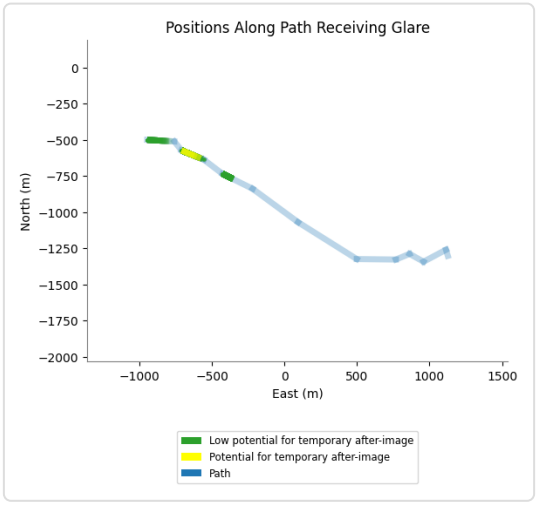
Yellow glare: 4 min.

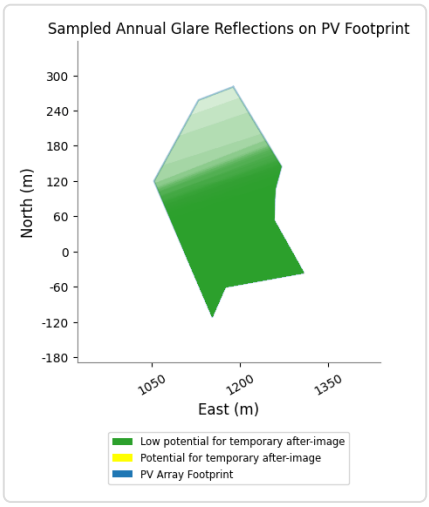
Green glare: 1,882 min.







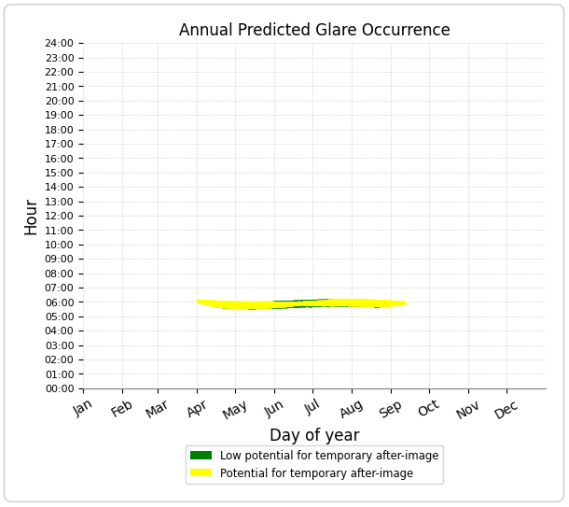


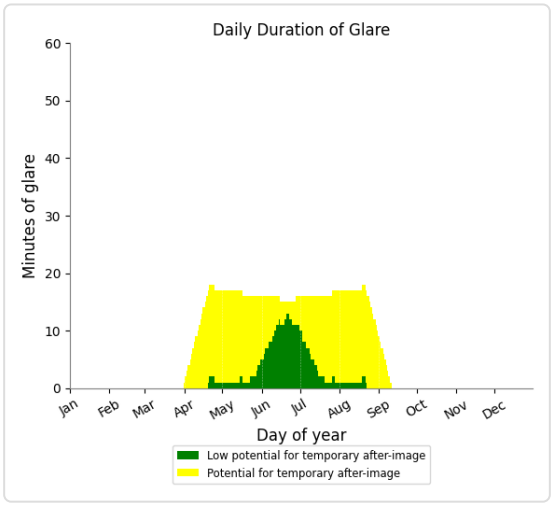


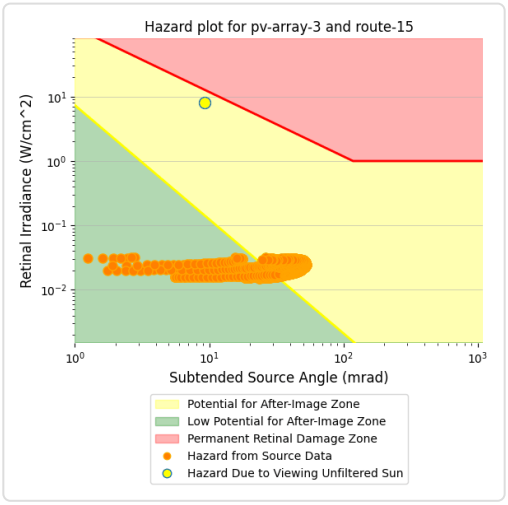
PV array 3 and Route: Route 15

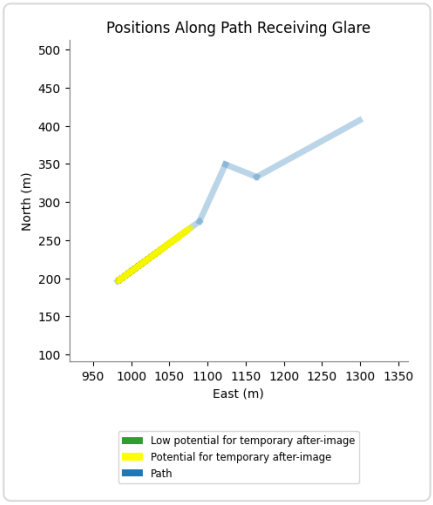
Yellow glare: 1,877 min.

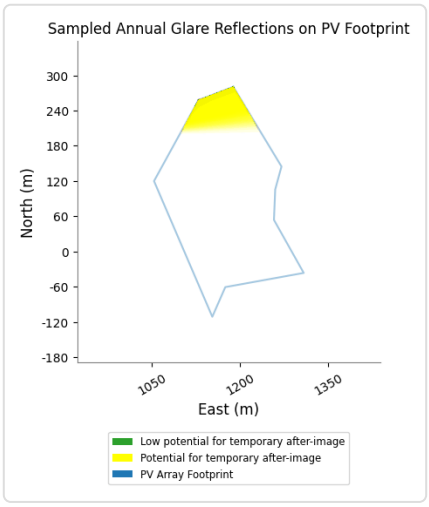
Green glare: 507 min.







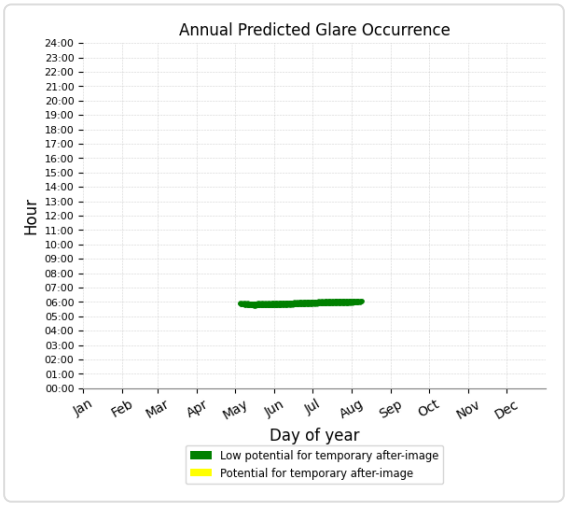


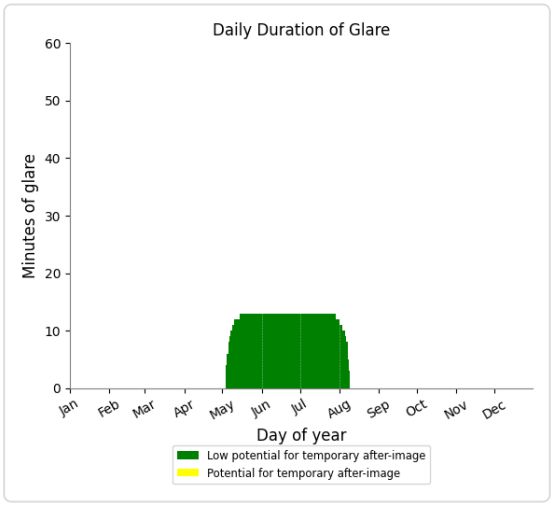


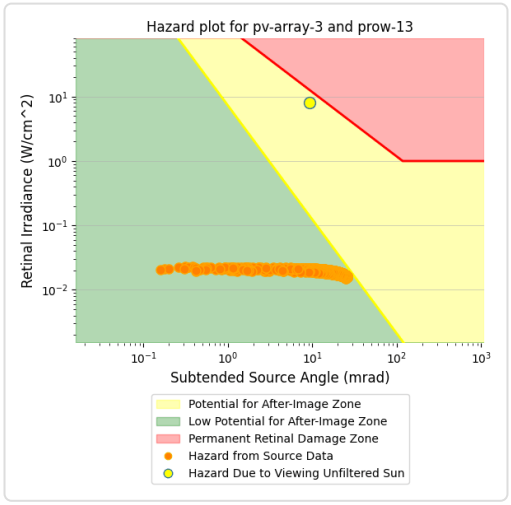
PV array 3 and Route: PRoW 13

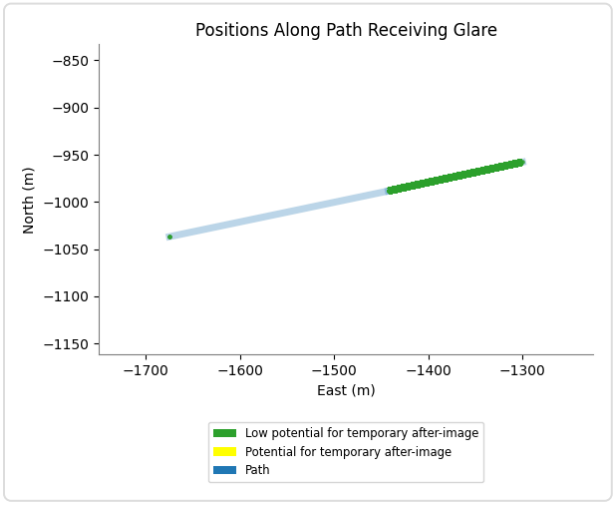
Yellow glare: none

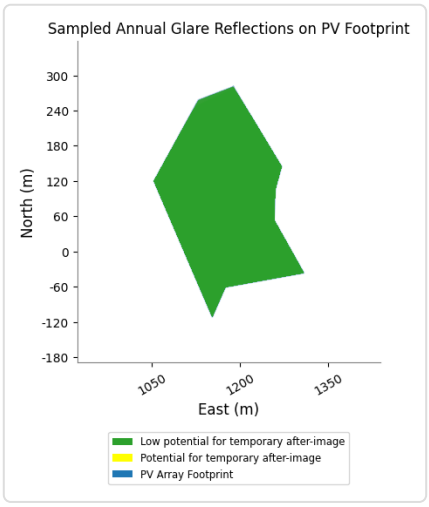
Green glare: 1,198 min.







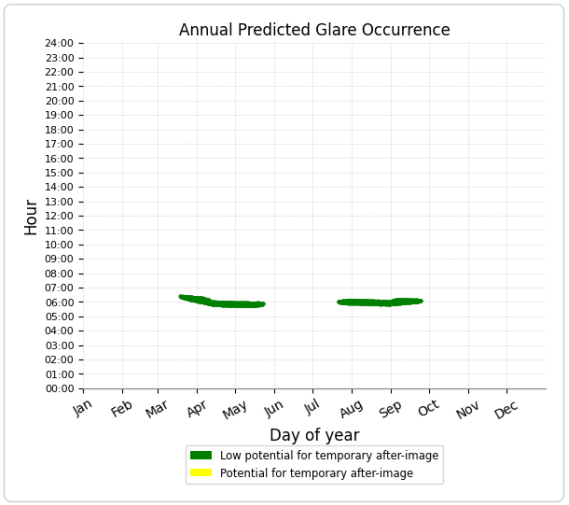


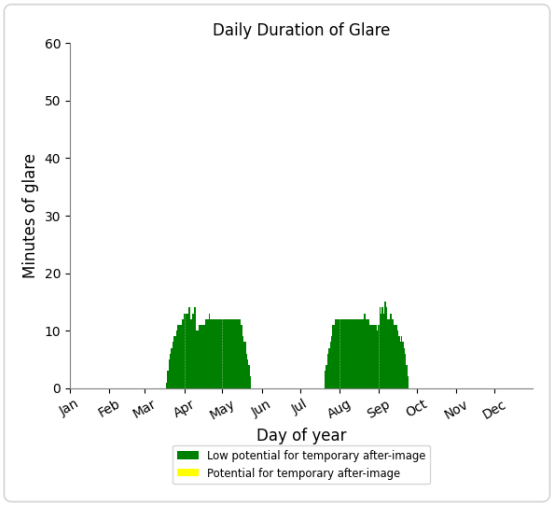


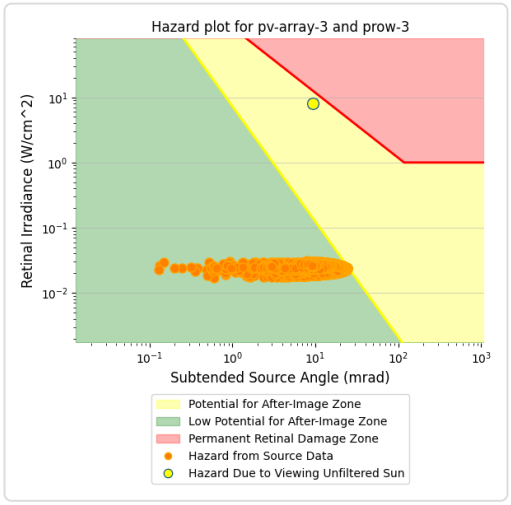
PV array 3 and Route: PRoW 3

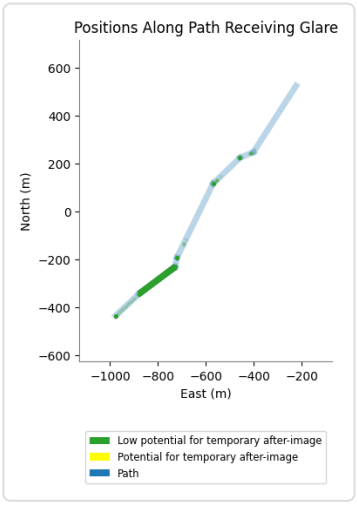
Yellow glare: none

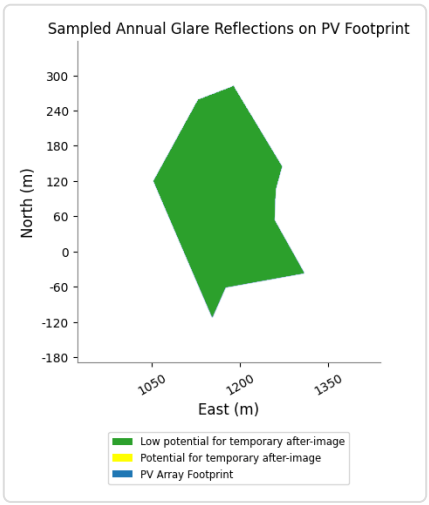
Green glare: 1,422 min.







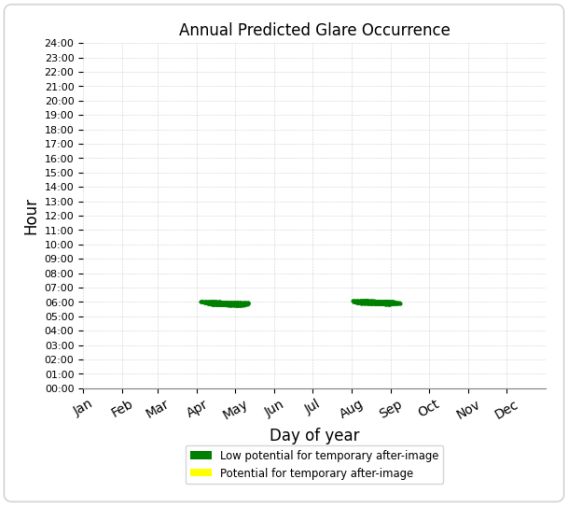


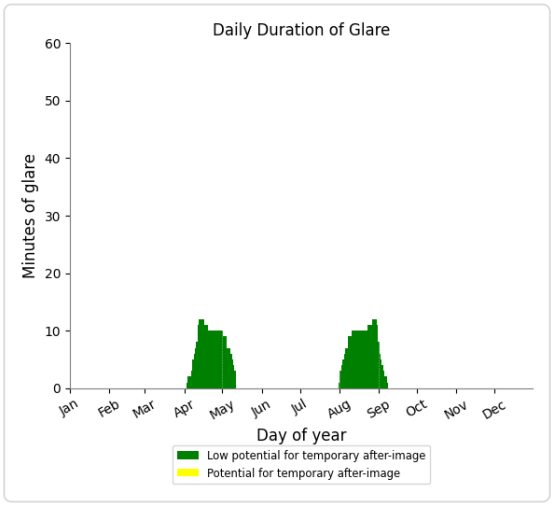


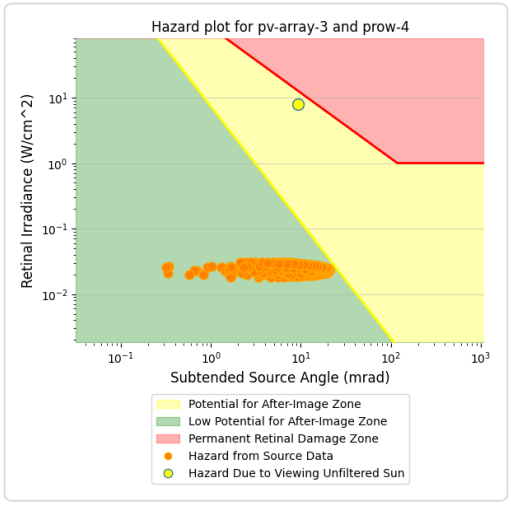
PV array 3 and Route: PRoW 4

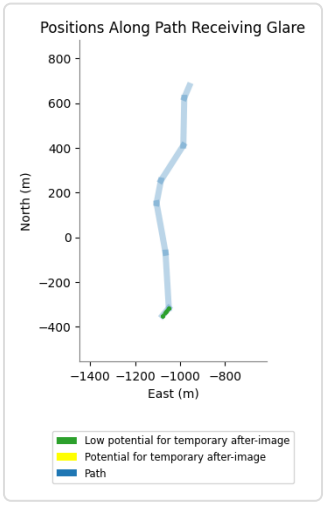
Yellow glare: none

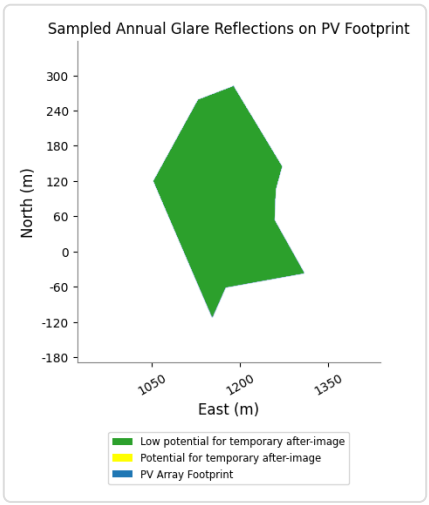
Green glare: 627 min.







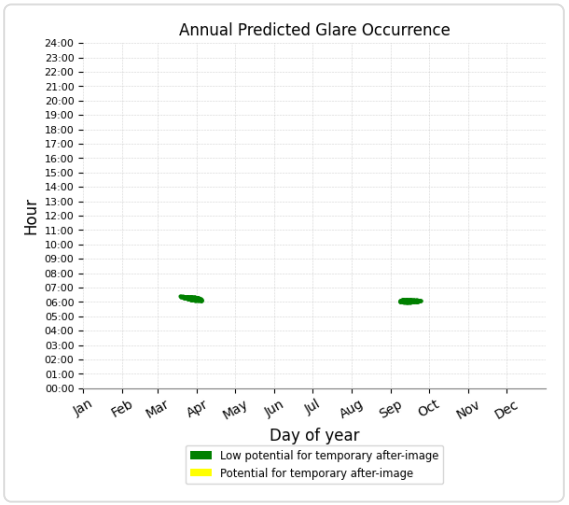


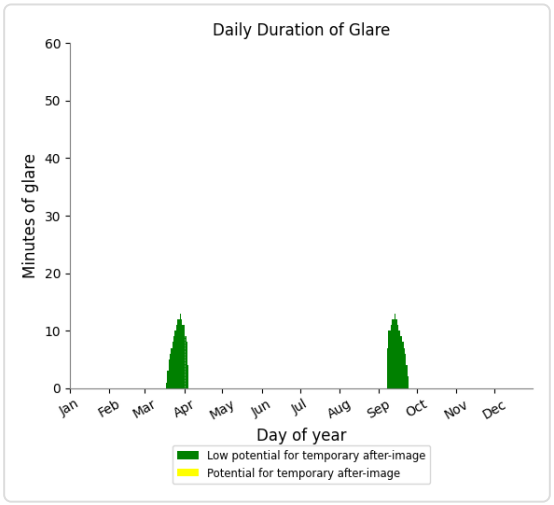


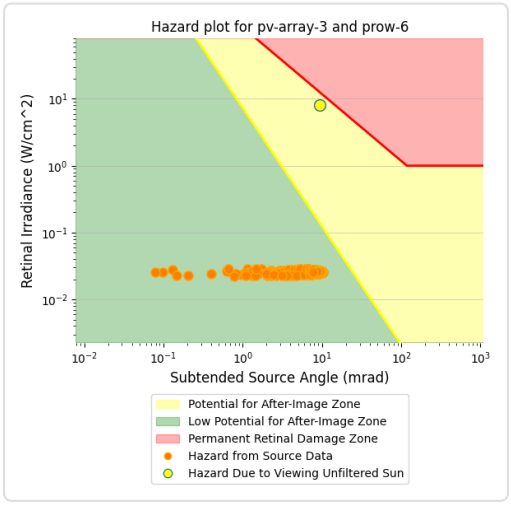
PV array 3 and Route: PRoW 6

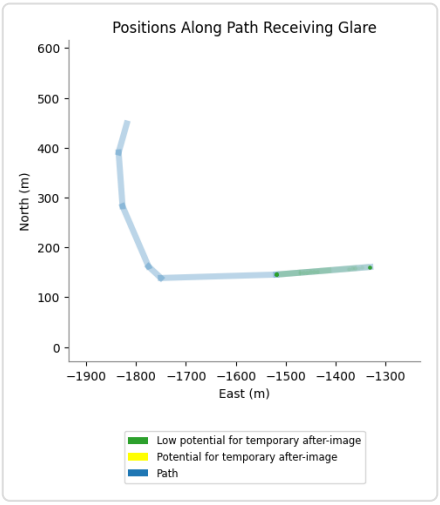
Yellow glare: none

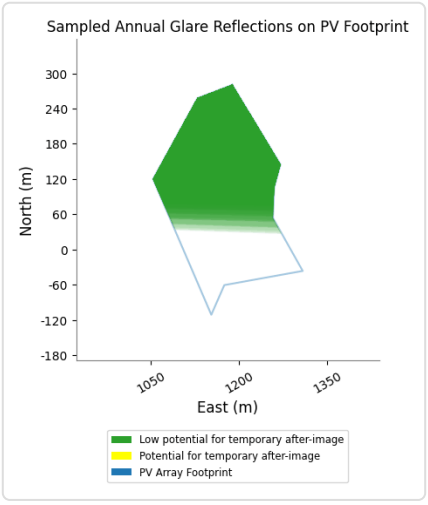
Green glare: 305 min.











PV array 3 and Route: PRoW 12

No glare found

PV array 3 and Route: PRoW 11

No glare found

PV array 3 and Route: PRoW 2

No glare found

PV array 3 and Route: PRoW 5

No glare found

PV array 3 and Route: PRoW 7

No glare found

PV: PV array 4 potential temporary after-image

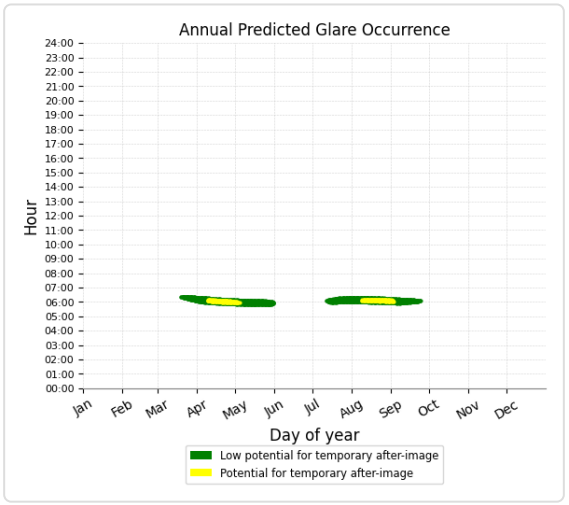
Receptor results ordered by category of glare

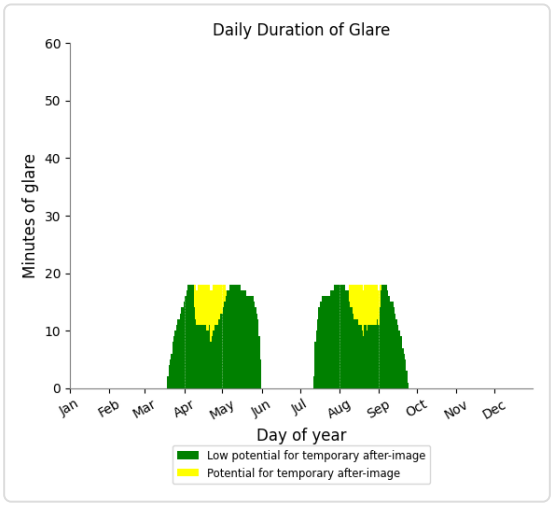
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 13	1,979	33.0	323	5.4
PRoW 2	579	9.7	1,607	26.8
PRoW 7	620	10.3	319	5.3
PRoW 8	974	16.2	3,049	50.8
Route 10	836	13.9	3,061	51.0
PRoW 1	182	3.0	0	0.0
PRoW 3	581	9.7	0	0.0
PRoW 4	369	6.2	0	0.0
PRoW 5	17	0.3	0	0.0
PRoW 9	44	0.7	0	0.0
PRoW 12	0	0.0	0	0.0
PRoW 11	0	0.0	0	0.0
PRoW 14	0	0.0	0	0.0
PRoW 6	0	0.0	0	0.0
Route 15	0	0.0	0	0.0

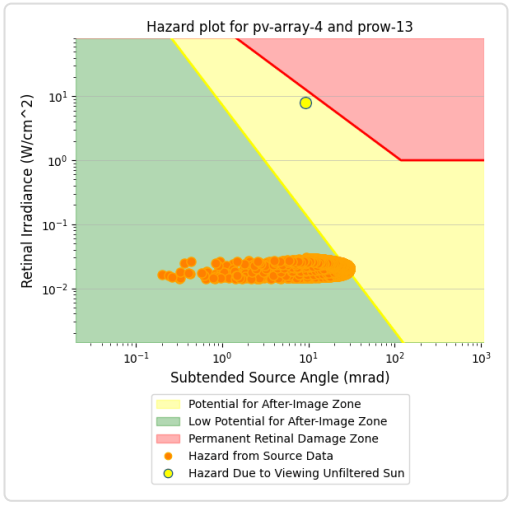
PV array 4 and Route: PRoW 13

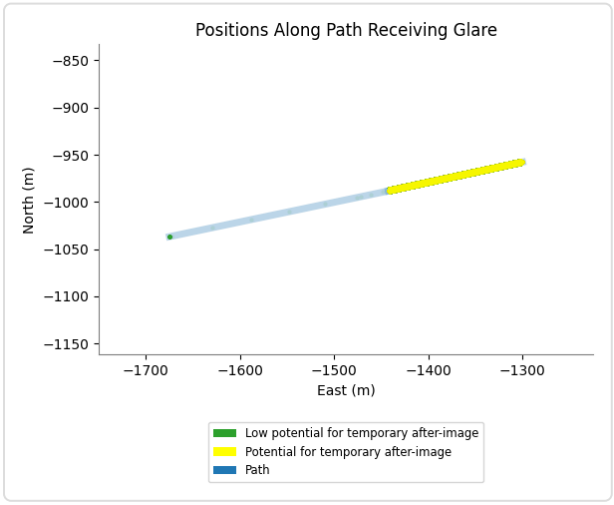
Yellow glare: 323 min.

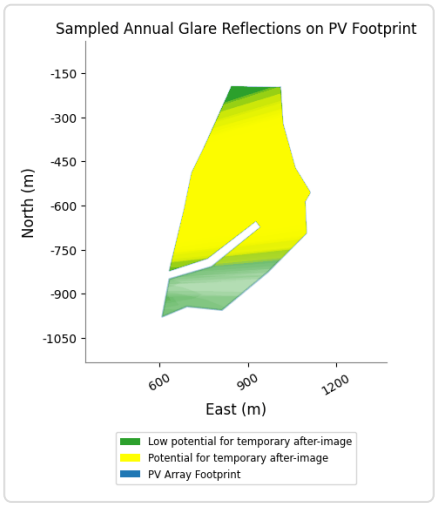
Green glare: 1,979 min.







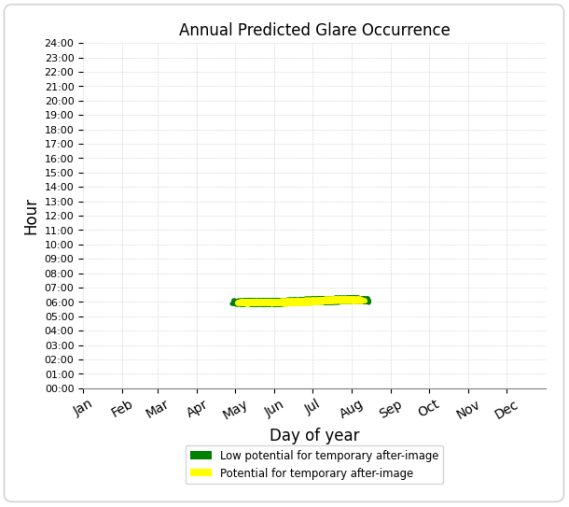


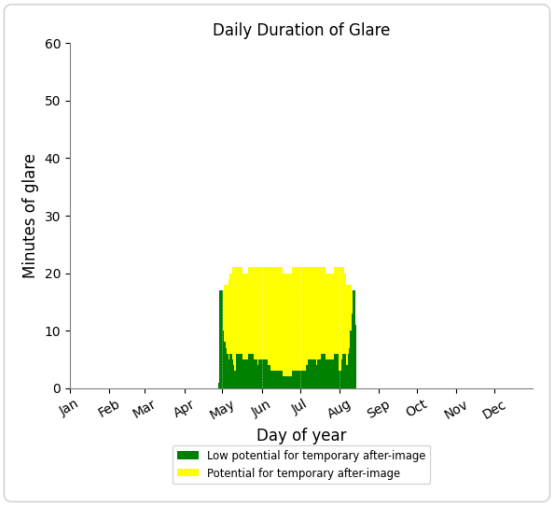


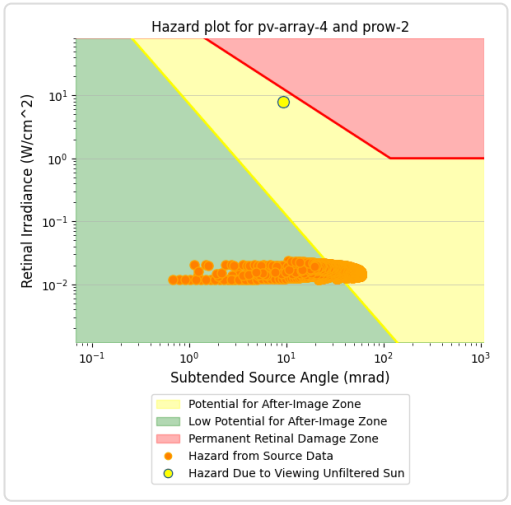
PV array 4 and Route: PRoW 2

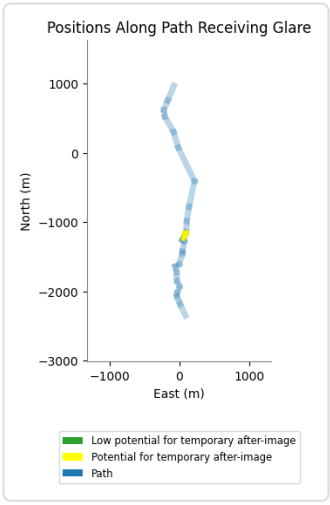
Yellow glare: 1,607 min.

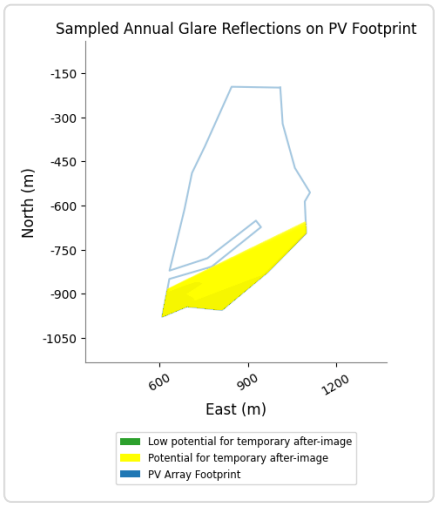
Green glare: 579 min.







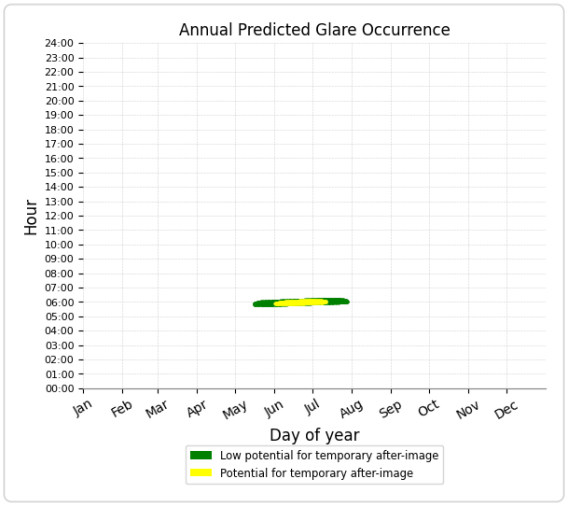


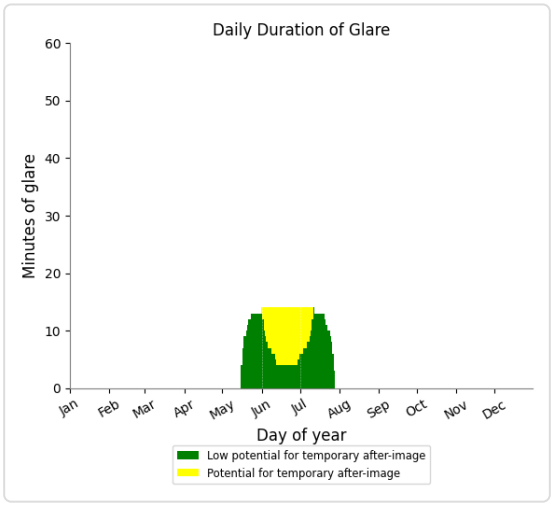


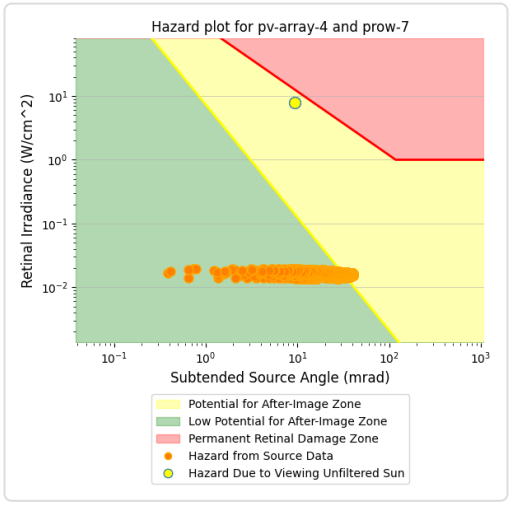
PV array 4 and Route: PRoW 7

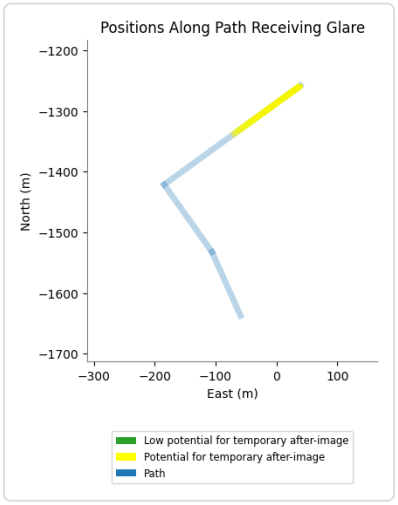
Yellow glare: 319 min.

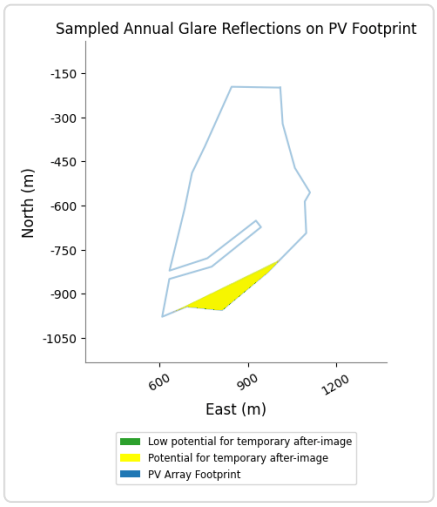
Green glare: 620 min.







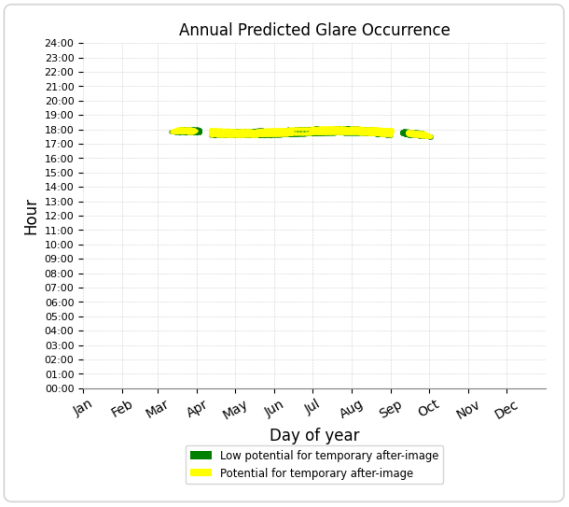


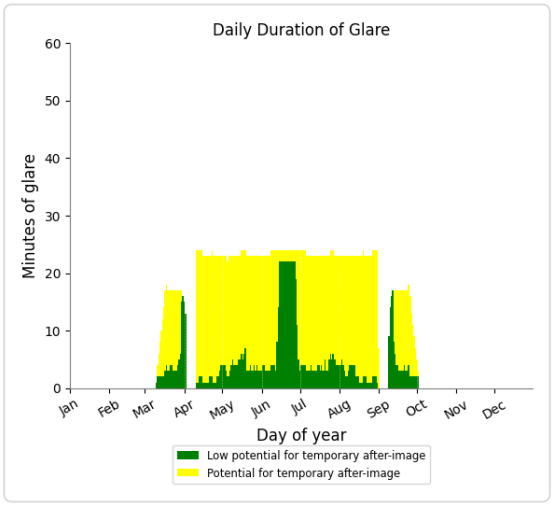


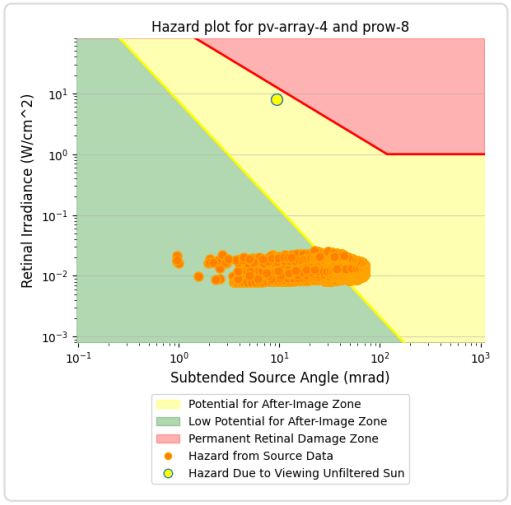
PV array 4 and Route: PRoW 8

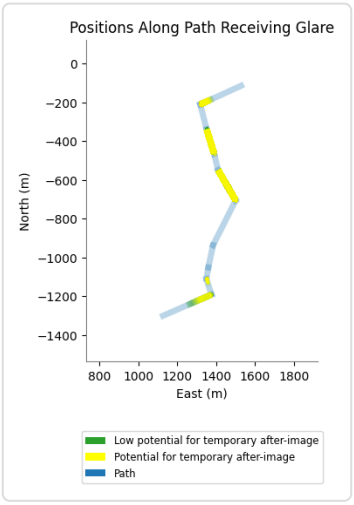
Yellow glare: 3,049 min.

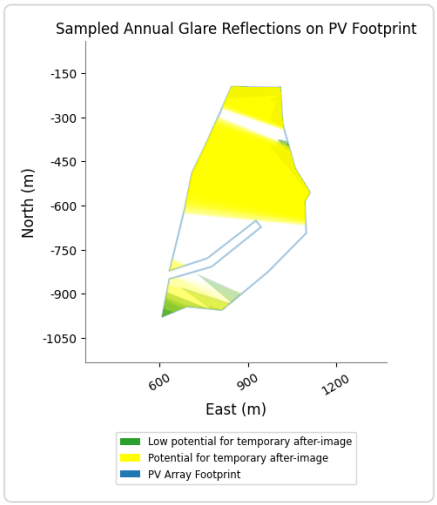
Green glare: 974 min.







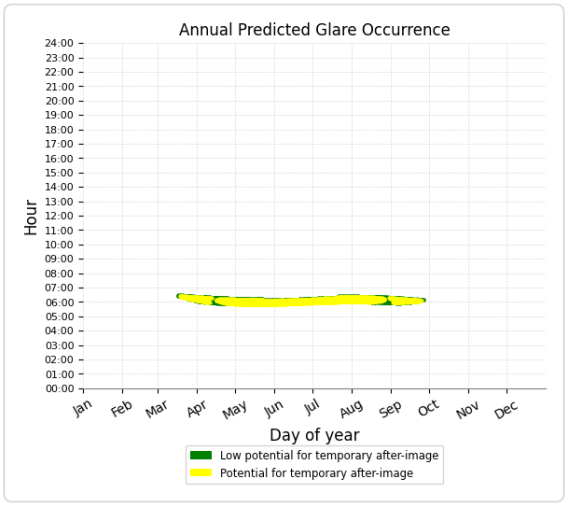


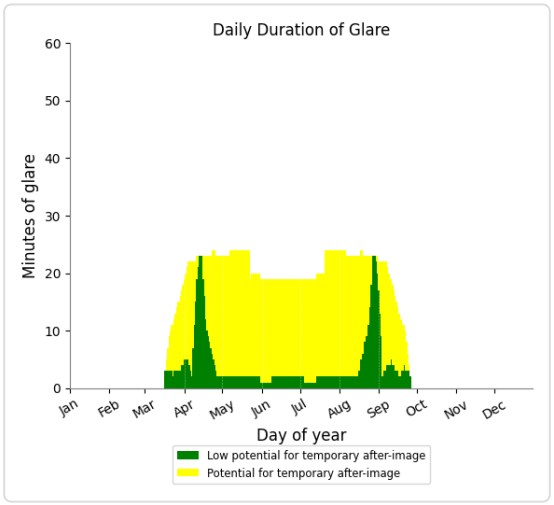


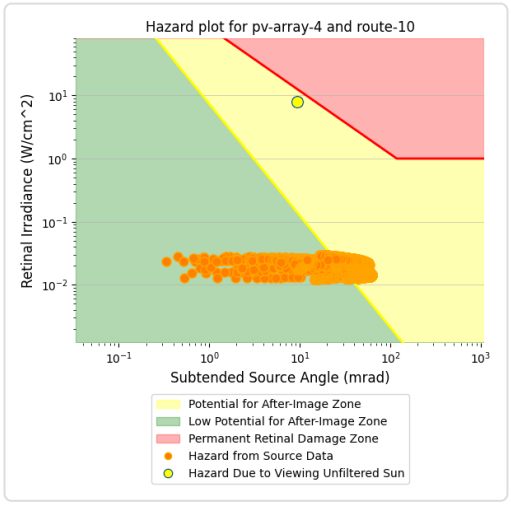
PV array 4 and Route: Route 10

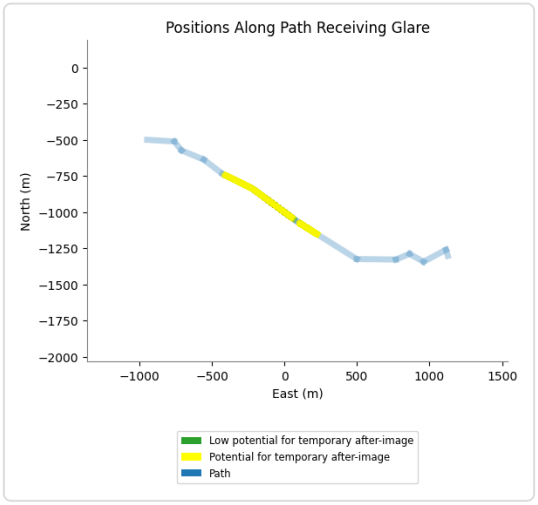
Yellow glare: 3,061 min.

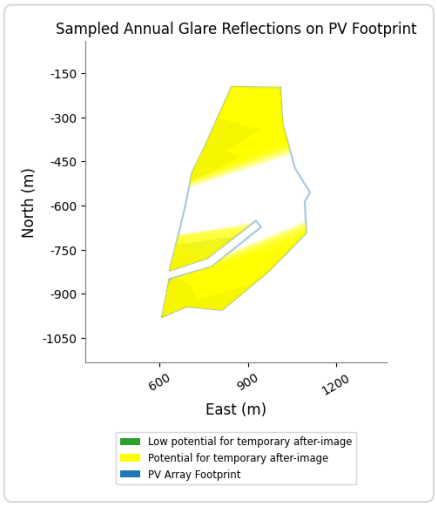
Green glare: 836 min.







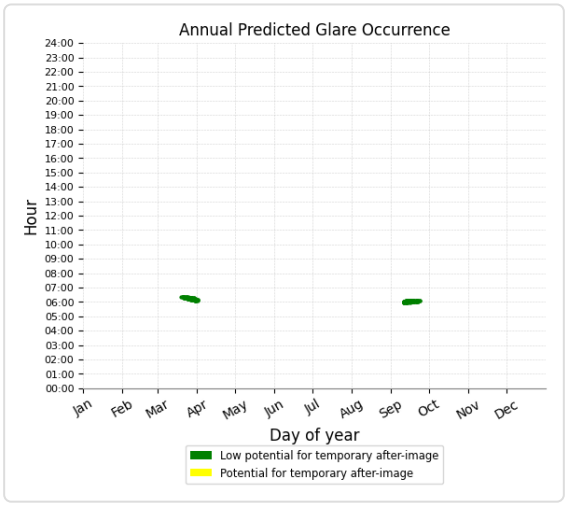


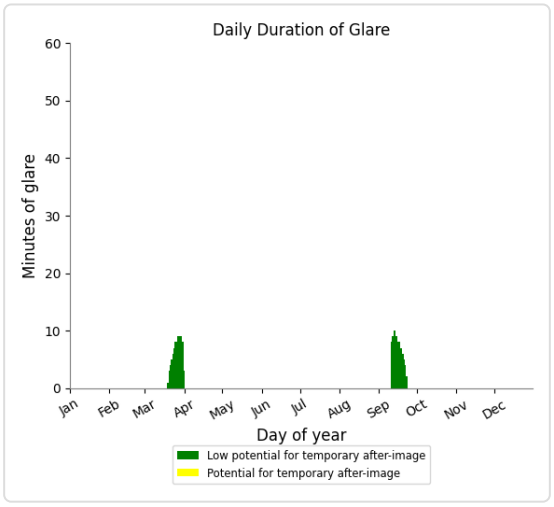


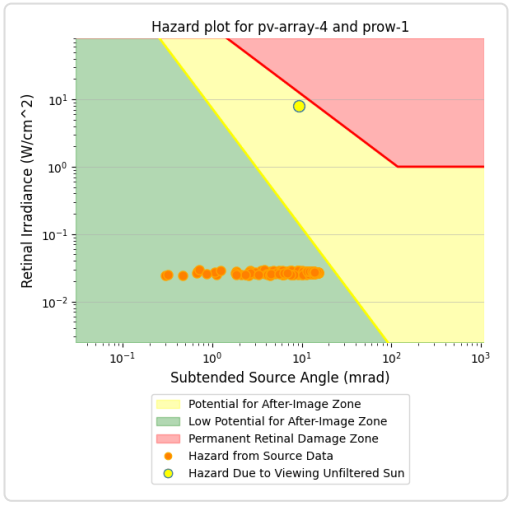
PV array 4 and Route: PRoW 1

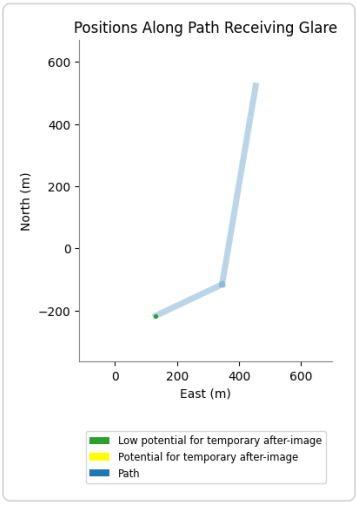
Yellow glare: none

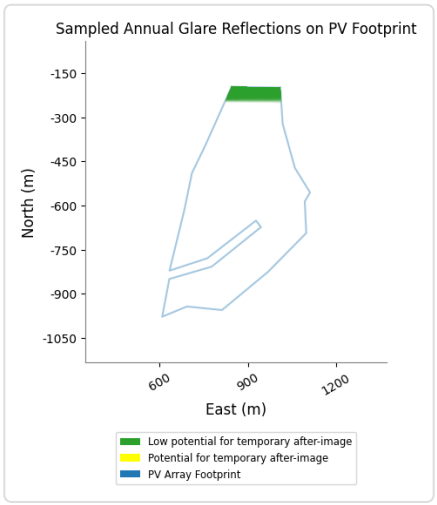
Green glare: 182 min.







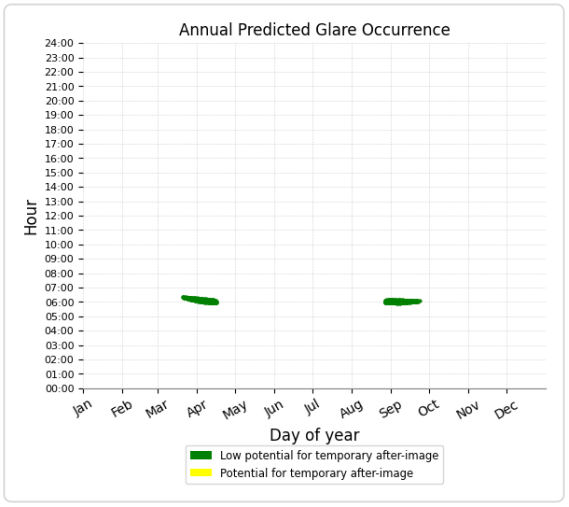


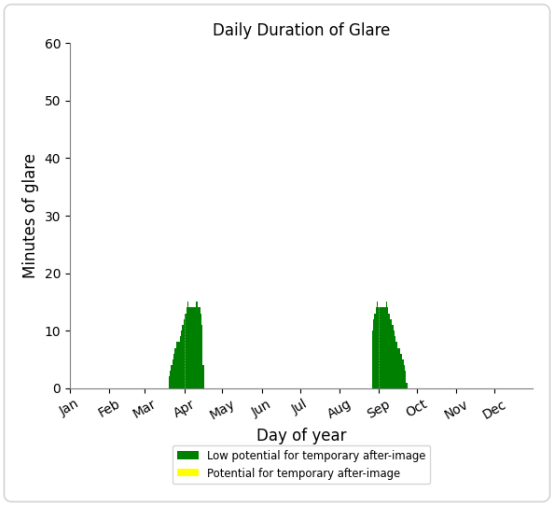


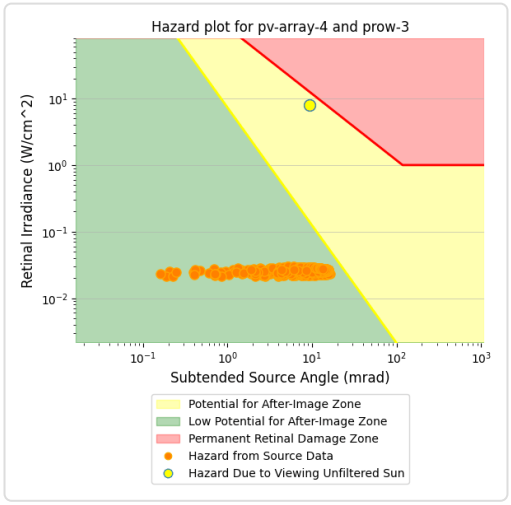
PV array 4 and Route: PRoW 3

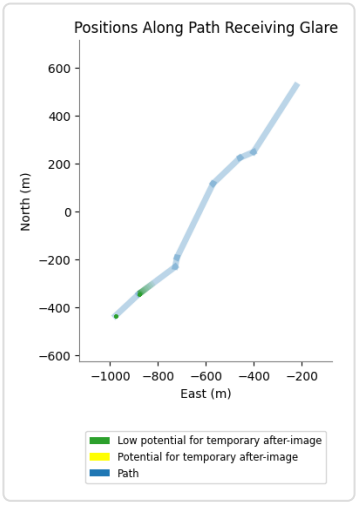
Yellow glare: none

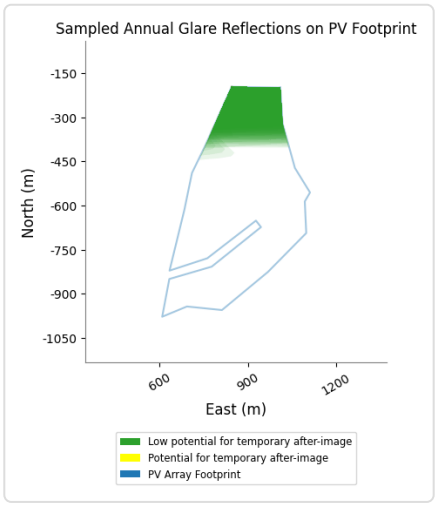
Green glare: 581 min.







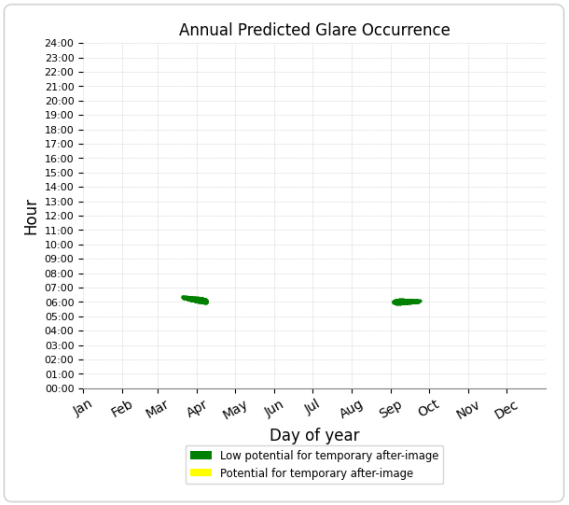


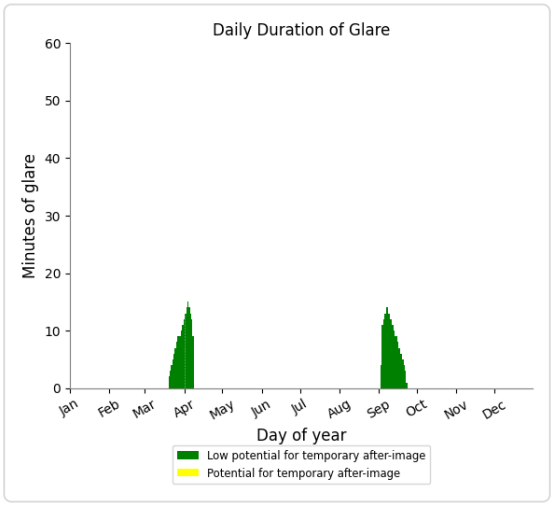


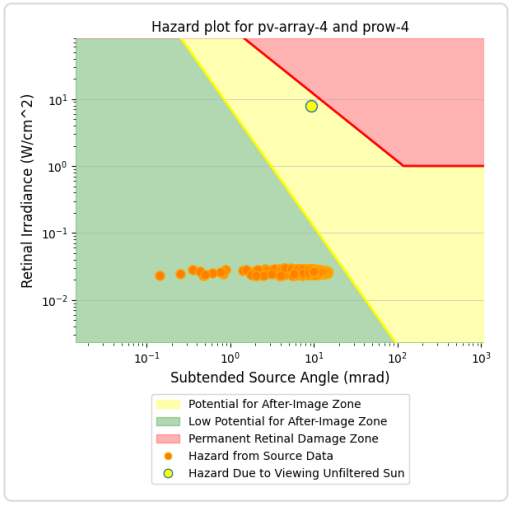
PV array 4 and Route: PRoW 4

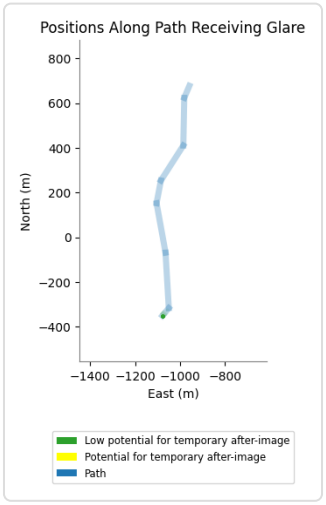
Yellow glare: none

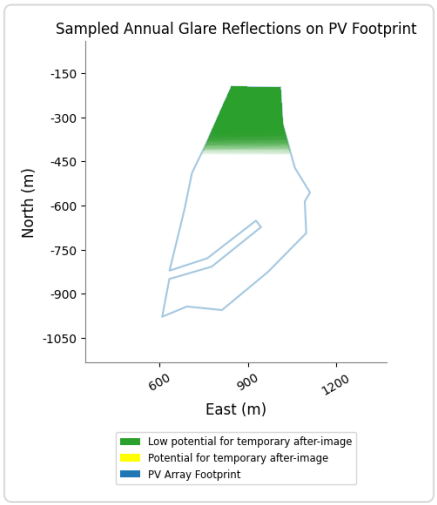
Green glare: 369 min.







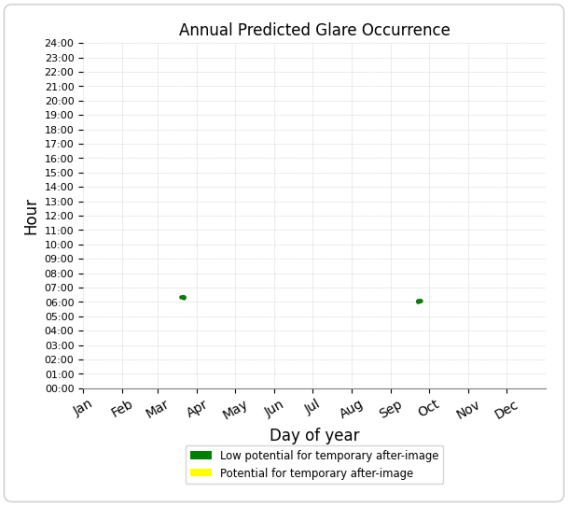


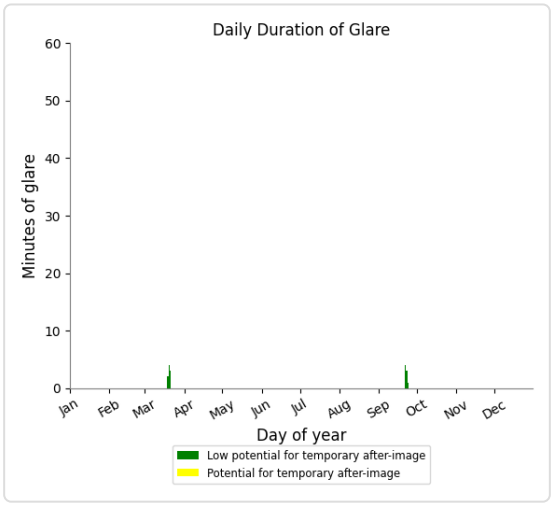


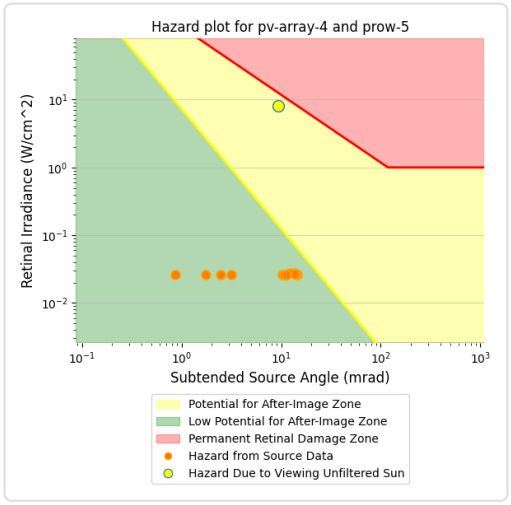
PV array 4 and Route: PRoW 5

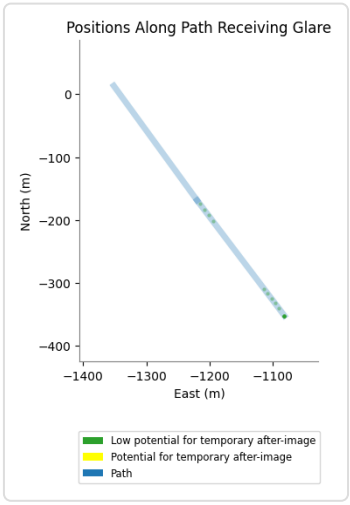
Yellow glare: none

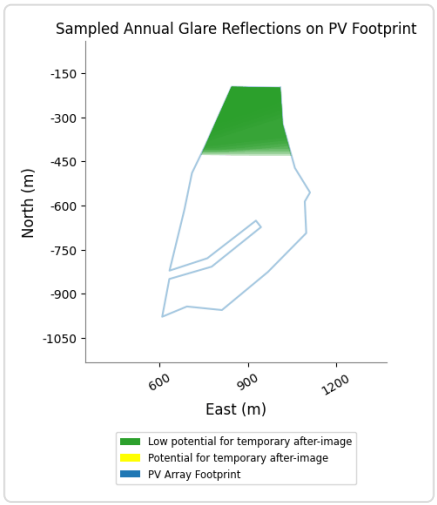
Green glare: 17 min.







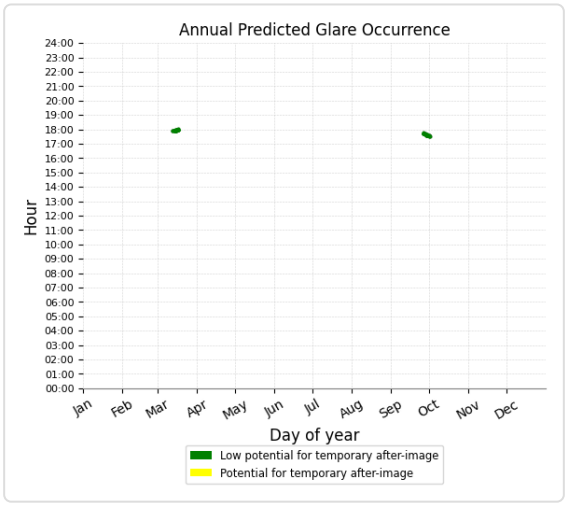


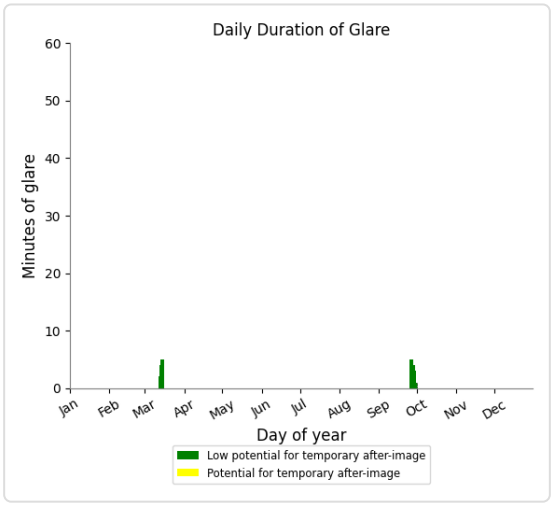


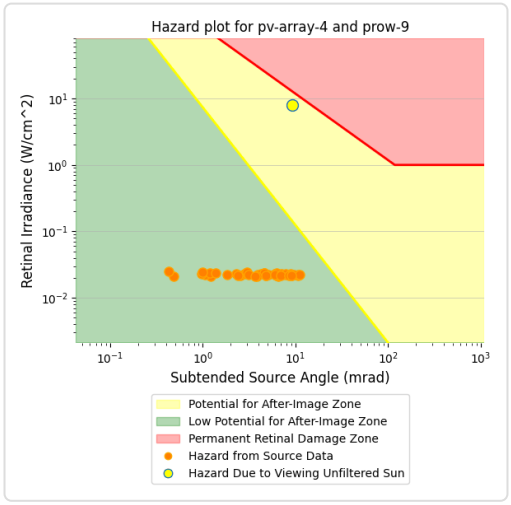
PV array 4 and Route: PRoW 9

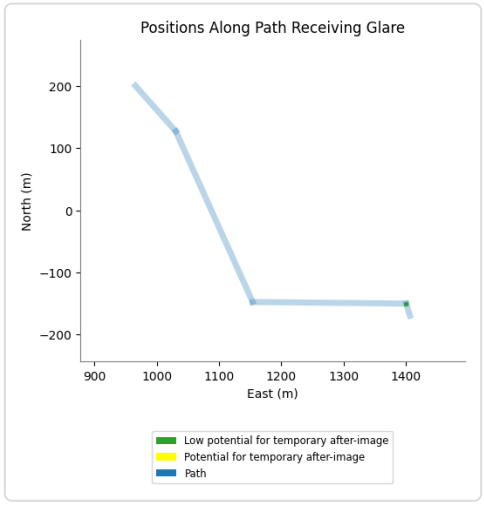
Yellow glare: none

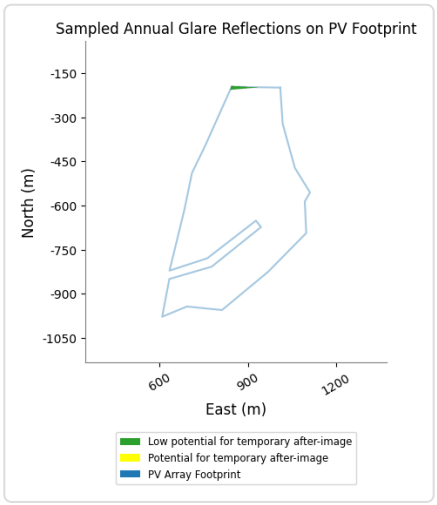
Green glare: 44 min.











PV array 4 and Route: PRoW 12

No glare found

PV array 4 and Route: PRoW 11

No glare found

PV array 4 and Route: PRoW 14

No glare found

PV array 4 and Route: PRoW 6

No glare found

PV array 4 and Route: Route 15

No glare found

PV: PV array 5 potential temporary after-image

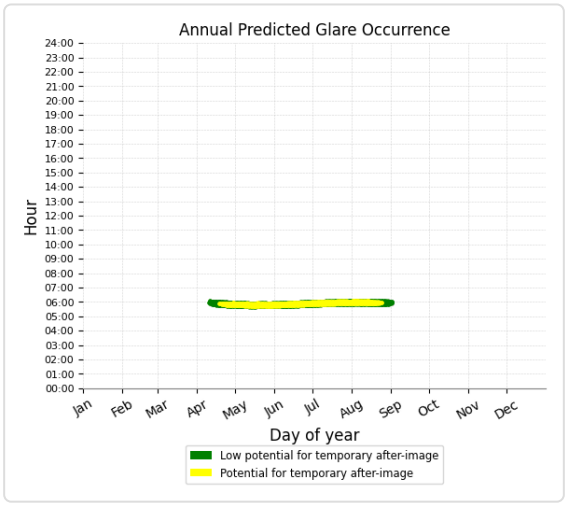
Receptor results ordered by category of glare

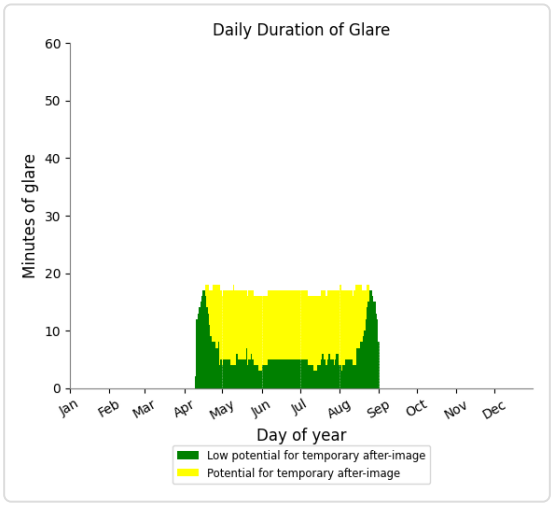
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2	929	15.5	1,476	24.6
PRoW 7	790	13.2	1,571	26.2
PRoW 8	2,172	36.2	9,905	165.1
Route 10	1,039	17.3	1,368	22.8
PRoW 13	467	7.8	0	0.0
PRoW 3	23	0.4	0	0.0
PRoW 1	0	0.0	0	0.0
PRoW 12	0	0.0	0	0.0
PRoW 11	0	0.0	0	0.0
PRoW 14	0	0.0	0	0.0
PRoW 4	0	0.0	0	0.0
PRoW 5	0	0.0	0	0.0
PRoW 6	0	0.0	0	0.0
PRoW 9	0	0.0	0	0.0
Route 15	0	0.0	0	0.0

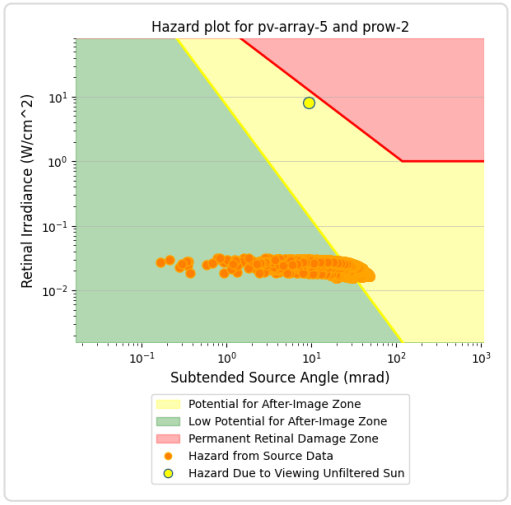
PV array 5 and Route: PRoW 2

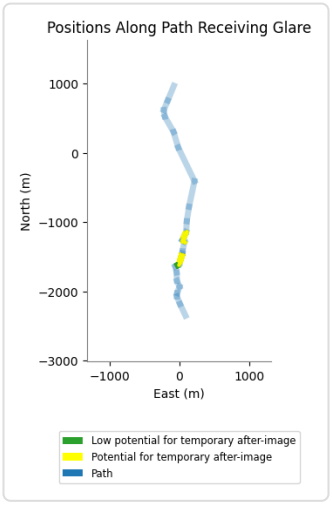
Yellow glare: 1,476 min.

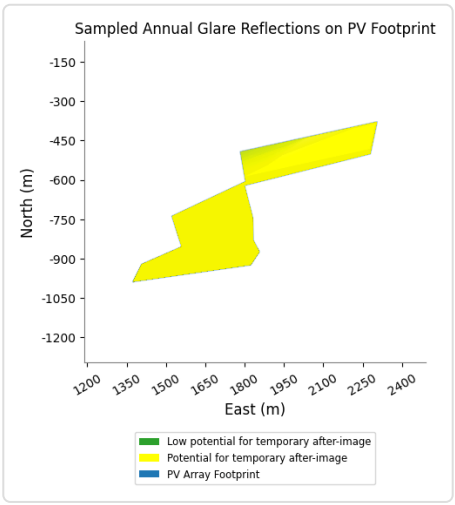
Green glare: 929 min.







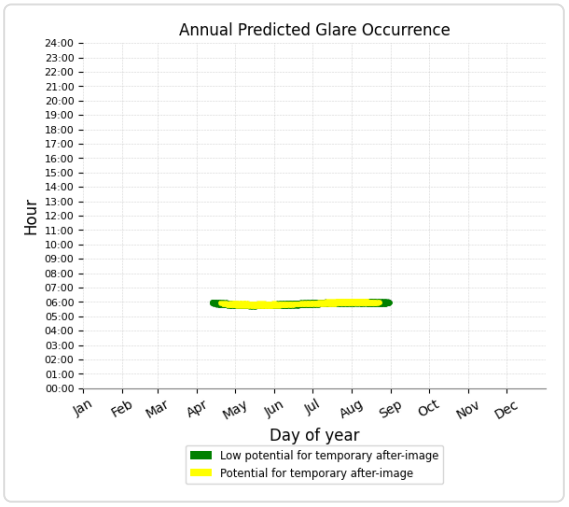


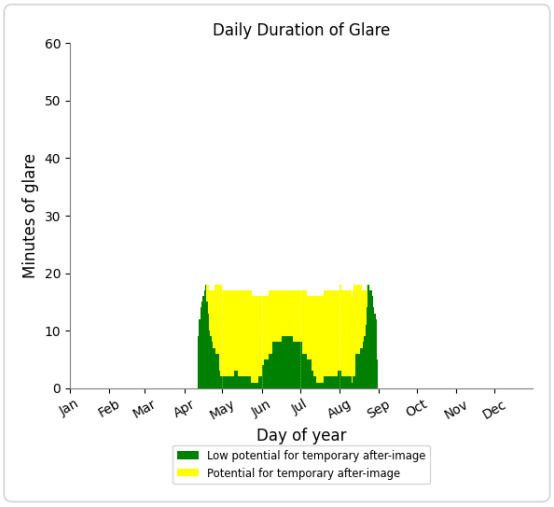


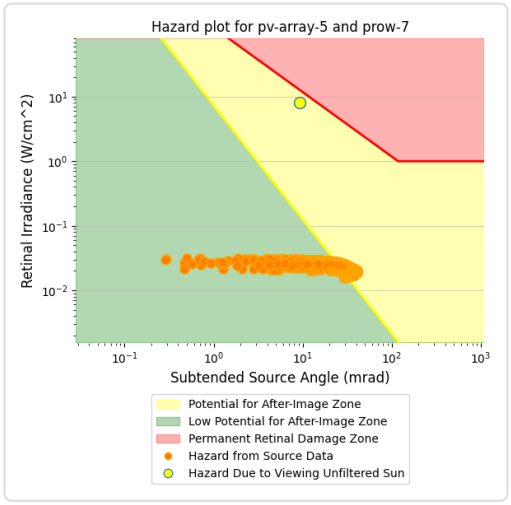
PV array 5 and Route: PRoW 7

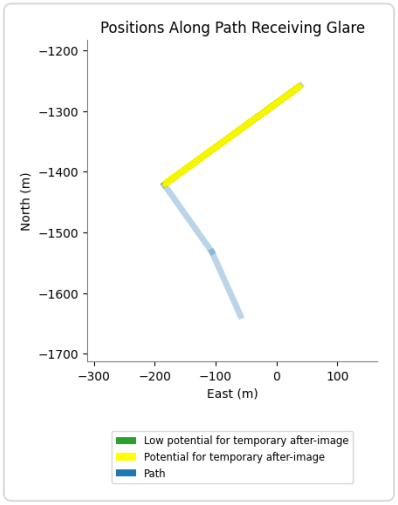
Yellow glare: 1,571 min.

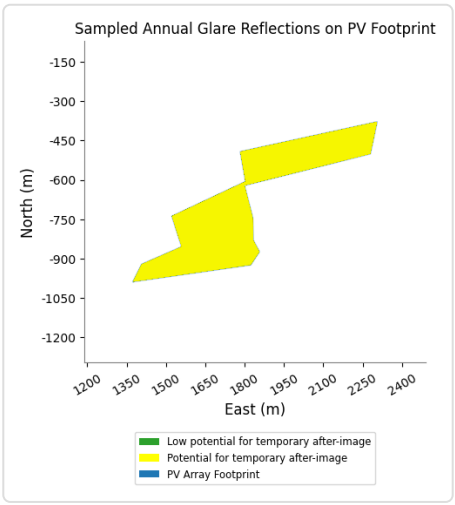
Green glare: 790 min.







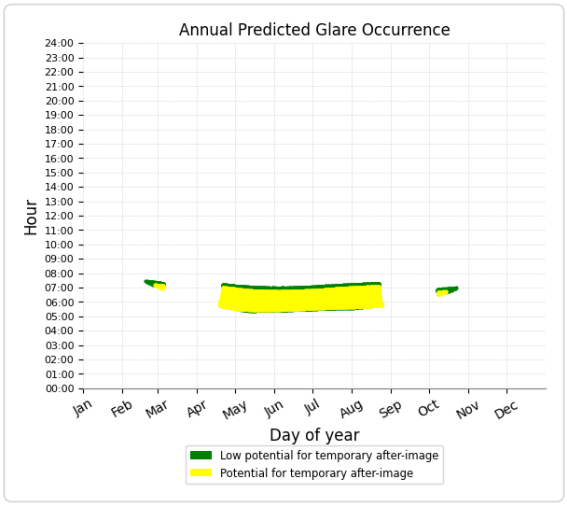


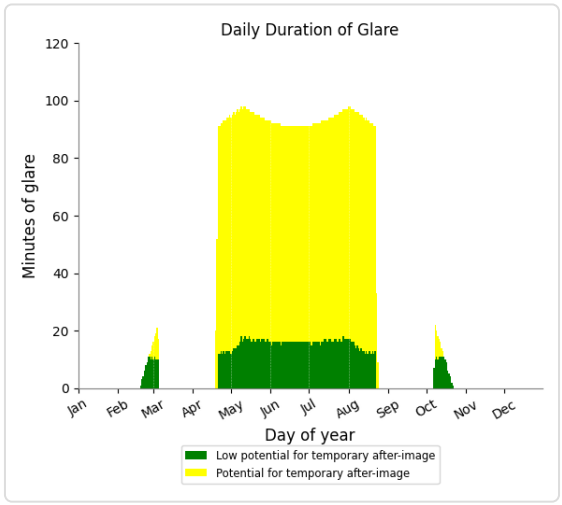


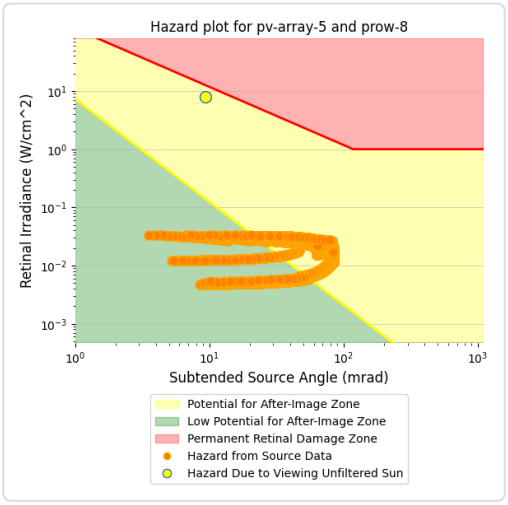
PV array 5 and Route: PRoW 8

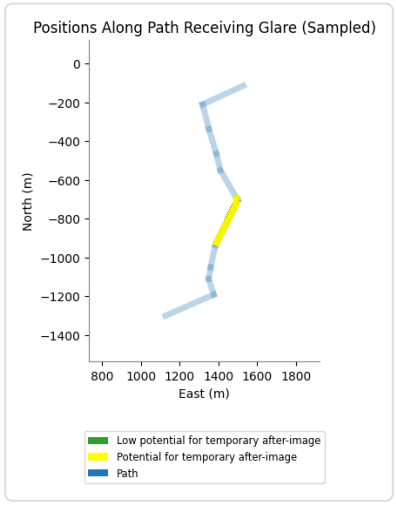
Yellow glare: 9,905 min.

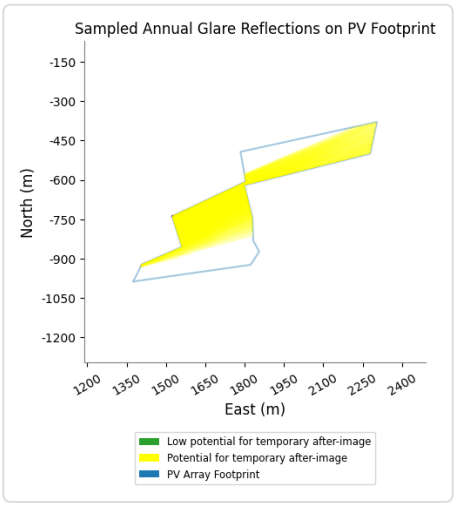
Green glare: 2,172 min.







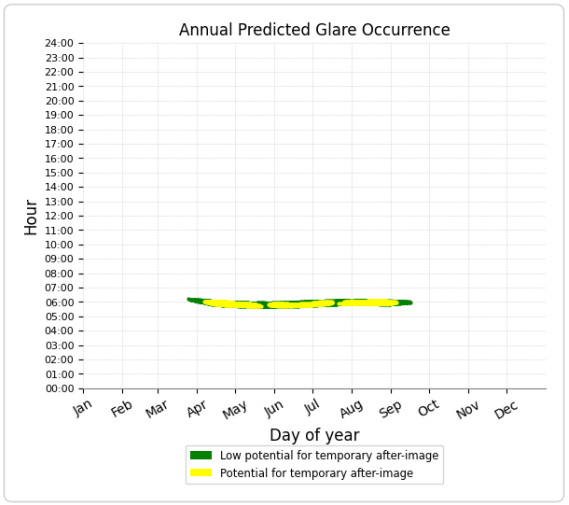


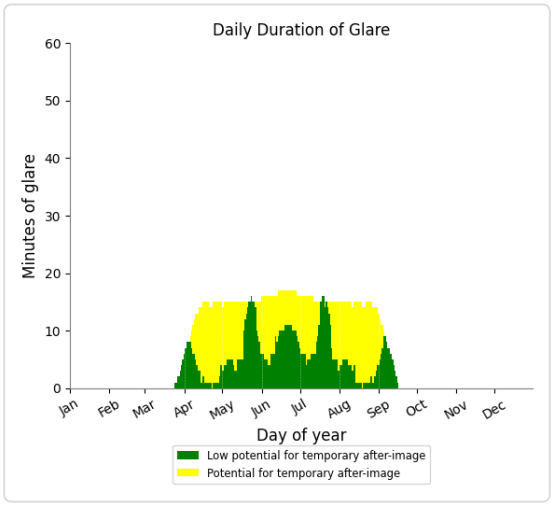


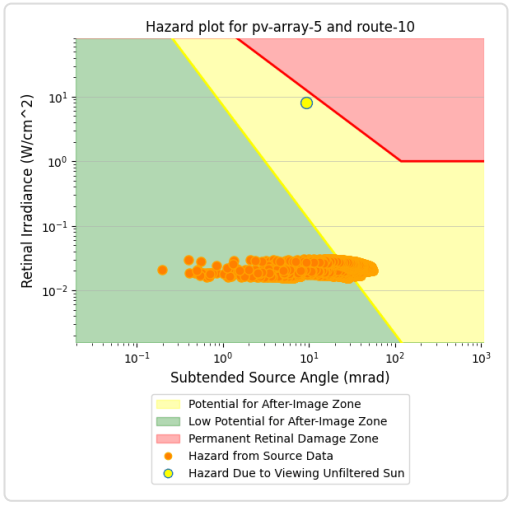
PV array 5 and Route: Route 10

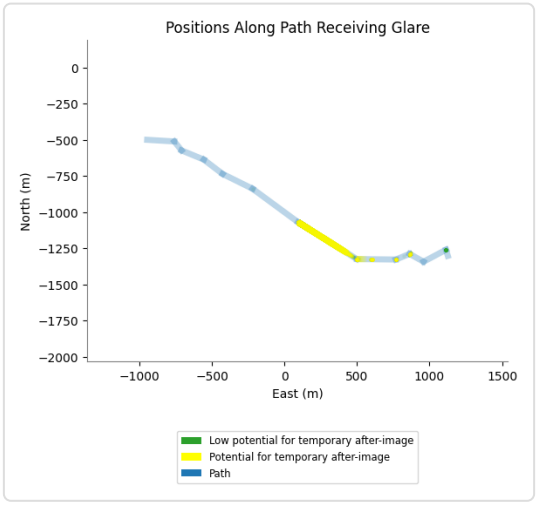
Yellow glare: 1,368 min.

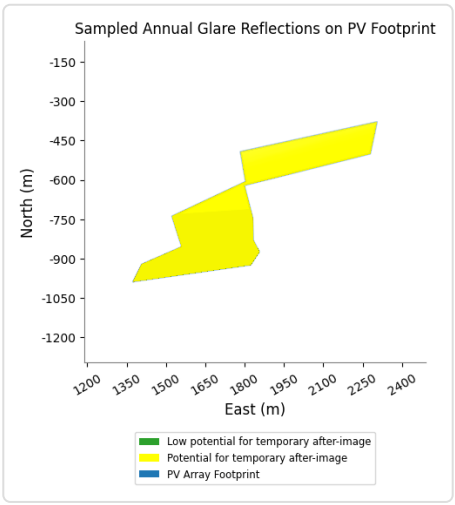
Green glare: 1,039 min.







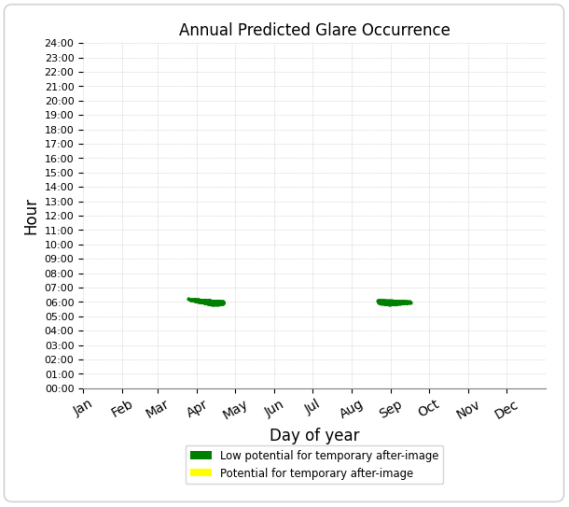


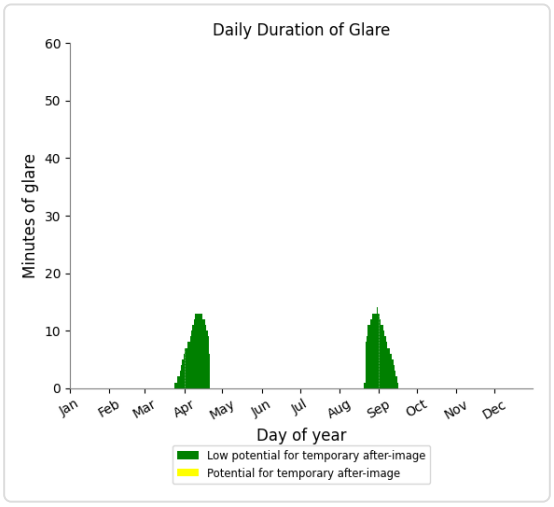


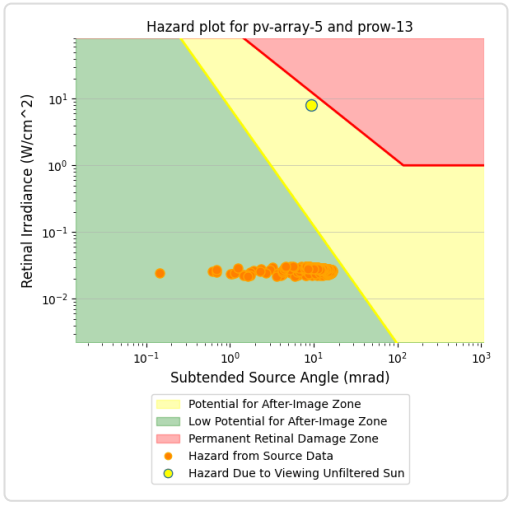
PV array 5 and Route: PRoW 13

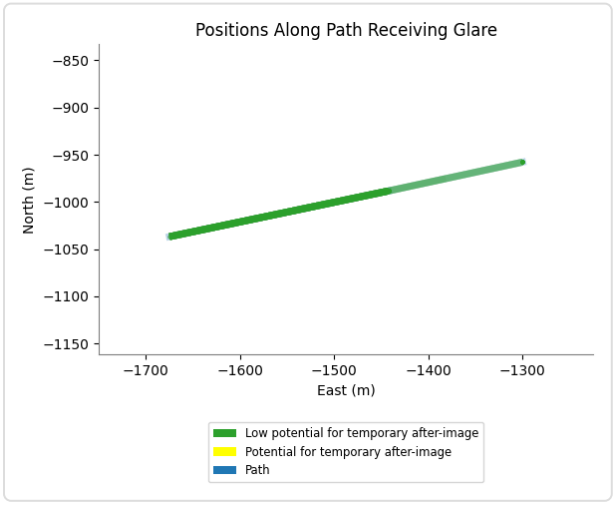
Yellow glare: none

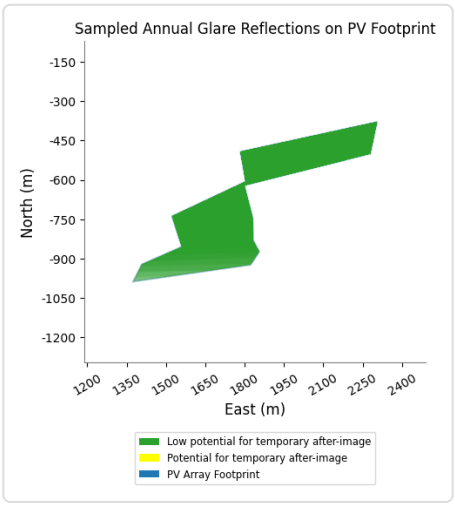
Green glare: 467 min.







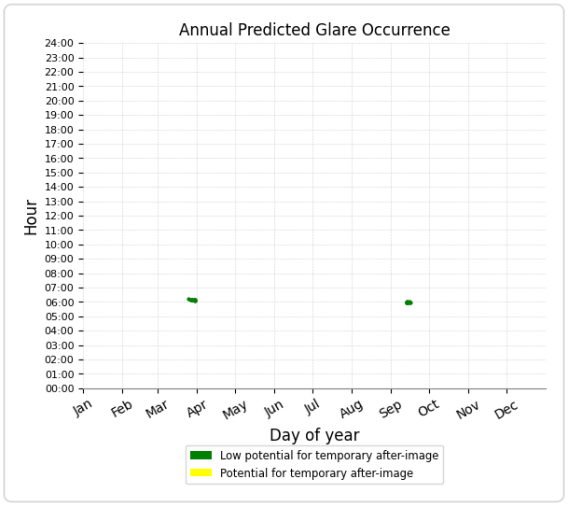


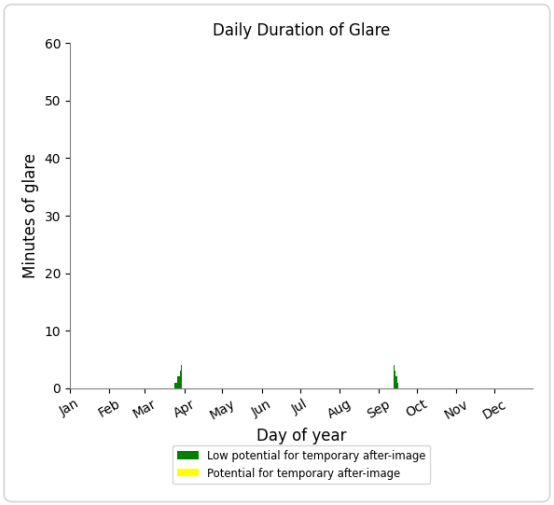


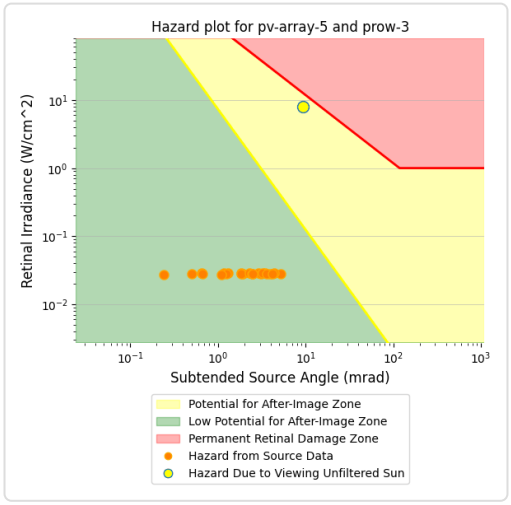
PV array 5 and Route: PRoW 3

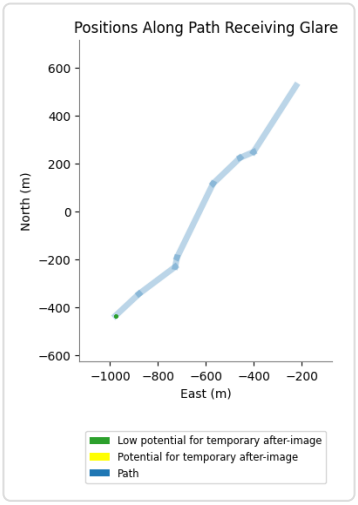
Yellow glare: none

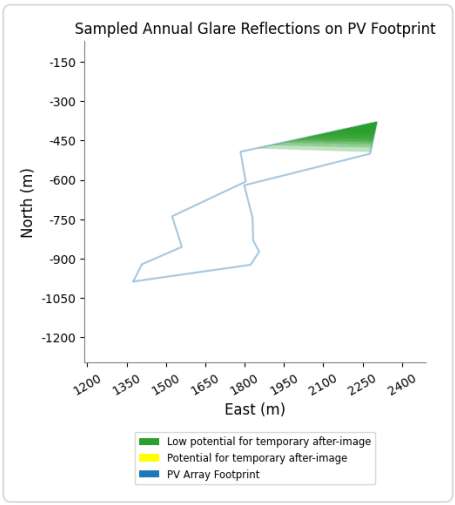
Green glare: 23 min.











PV array 5 and Route: PRoW 1

No glare found

PV array 5 and Route: PRoW 12

No glare found

PV array 5 and Route: PRoW 11

No glare found

PV array 5 and Route: PRoW 14

No glare found

PV array 5 and Route: PRoW 4

No glare found

PV array 5 and Route: PRoW 5

No glare found

PV array 5 and Route: PRoW 6

No glare found

PV array 5 and Route: PRoW 9

No glare found

PV array 5 and Route: Route 15

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 1**
Site configuration: **JS W1 - Aviation**

Created 02 Jul, 2025
Updated 26 Nov, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 500 kW to 1 MW
Site ID 153788.25566

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	0	0.0	0	0.0	-
PV array 2	25.0	180.0	0	0.0	0	0.0	-
PV array 3	25.0	180.0	0	0.0	0	0.0	-
PV array 4	25.0	180.0	0	0.0	0	0.0	-
PV array 5	25.0	180.0	0	0.0	0	0.0	-

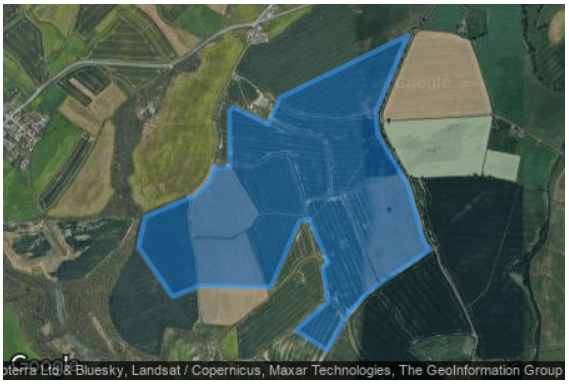
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

Component Data

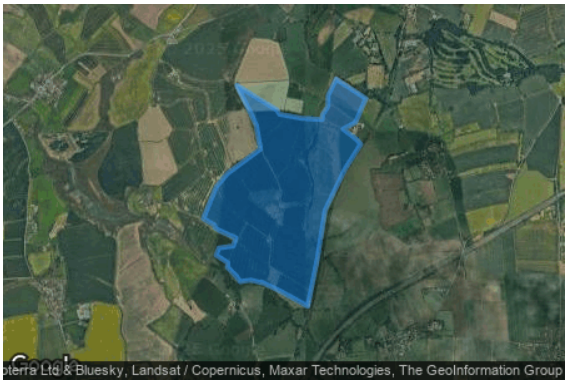
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.462880	-1.242763	80.60	3.80	84.40
2	53.461615	-1.245982	76.30	3.80	80.10
3	53.461117	-1.247097	70.70	3.80	74.50
4	53.460248	-1.248428	70.10	3.80	73.90
5	53.458766	-1.249812	78.70	3.80	82.50
6	53.459596	-1.252011	72.20	3.80	76.00
7	53.460759	-1.249780	66.60	3.80	70.40
8	53.462151	-1.250155	67.40	3.80	71.20
9	53.462362	-1.249769	66.30	3.80	70.10
10	53.462650	-1.250026	65.00	3.80	68.80
11	53.464150	-1.251099	66.70	3.80	70.50
12	53.464047	-1.251754	66.20	3.80	70.00
13	53.461346	-1.253738	60.60	3.80	64.40
14	53.461416	-1.258599	63.50	3.80	67.30
15	53.460975	-1.260476	67.20	3.80	71.00
16	53.462983	-1.262831	82.20	3.80	86.00
17	53.464219	-1.262370	83.30	3.80	87.10
18	53.464950	-1.259516	81.10	3.80	84.90
19	53.465077	-1.258915	80.50	3.80	84.30
20	53.465639	-1.257976	79.10	3.80	82.90
21	53.466204	-1.257649	78.40	3.80	82.20
22	53.466262	-1.256555	76.60	3.80	80.40
23	53.468550	-1.256575	78.50	3.80	82.30
24	53.468697	-1.256344	78.50	3.80	82.30
25	53.468007	-1.253919	78.10	3.80	81.90
26	53.469079	-1.253110	78.90	3.80	82.70
27	53.471629	-1.244293	77.00	3.80	80.80
28	53.468512	-1.246508	83.60	3.80	87.40
29	53.467605	-1.246379	82.70	3.80	86.50
30	53.465556	-1.244326	78.30	3.80	82.10
31	53.463205	-1.243211	79.60	3.80	83.40

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451858	-1.242251	76.10	3.80	79.90
2	53.452101	-1.243817	77.00	3.80	80.80
3	53.451968	-1.245330	76.40	3.80	80.20
4	53.452365	-1.245780	77.10	3.80	80.90
5	53.453157	-1.247089	73.80	3.80	77.60
6	53.453508	-1.247014	77.60	3.80	81.40
7	53.454133	-1.248632	80.80	3.80	84.60
8	53.454727	-1.248246	84.60	3.80	88.40
9	53.454880	-1.246271	89.30	3.80	93.10
10	53.455544	-1.245960	90.30	3.80	94.10
11	53.456142	-1.248170	86.90	3.80	90.70
12	53.456356	-1.248750	84.00	3.80	87.80
13	53.456595	-1.248900	83.60	3.80	87.40
14	53.457132	-1.250386	76.70	3.80	80.50
15	53.459695	-1.248626	72.60	3.80	76.40
16	53.460821	-1.247009	71.40	3.80	75.20
17	53.462776	-1.242546	80.50	3.80	84.30
18	53.464717	-1.243104	76.10	3.80	79.90
19	53.465886	-1.244037	77.30	3.80	81.10
20	53.467981	-1.245797	82.50	3.80	86.30
21	53.465982	-1.240304	65.80	3.80	69.60
22	53.465631	-1.239928	65.40	3.80	69.20
23	53.465299	-1.236903	62.50	3.80	66.30
24	53.465190	-1.234070	62.90	3.80	66.70
25	53.465573	-1.234006	62.10	3.80	65.90
26	53.466250	-1.233276	60.40	3.80	64.20
27	53.467151	-1.233244	57.90	3.80	61.70
28	53.468498	-1.232139	55.90	3.80	59.70
29	53.466900	-1.228049	68.80	3.80	72.60
30	53.464957	-1.229472	73.50	3.80	77.30
31	53.464421	-1.231172	72.30	3.80	76.10
32	53.464012	-1.230260	76.50	3.80	80.30
33	53.463498	-1.229219	81.20	3.80	85.00
34	53.463171	-1.228764	83.80	3.80	87.60
35	53.461159	-1.230909	82.30	3.80	86.10
36	53.457824	-1.233656	80.90	3.80	84.70
37	53.454042	-1.234665	90.90	3.80	94.70
38	53.449966	-1.236038	96.00	3.80	99.80
39	53.451282	-1.240093	81.60	3.80	85.40
40	53.451947	-1.242432	76.70	3.80	80.50

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465402	-1.224873	79.20	3.80	83.00
2	53.464182	-1.223639	86.50	3.80	90.30
3	53.463831	-1.223800	88.00	3.80	91.80
4	53.463365	-1.223832	90.80	3.80	94.60
5	53.462553	-1.223071	99.60	3.80	103.40
6	53.462336	-1.225077	95.10	3.80	98.90
7	53.461883	-1.225410	97.70	3.80	101.50
8	53.463959	-1.226901	83.10	3.80	86.90
9	53.465198	-1.225764	78.40	3.80	82.20

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461091	-1.227555	95.90	3.80	99.70
2	53.461116	-1.230044	85.70	3.80	89.50
3	53.459289	-1.231418	86.80	3.80	90.60
4	53.458484	-1.232072	86.60	3.80	90.40
5	53.457366	-1.232458	86.30	3.80	90.10
6	53.455504	-1.233220	87.80	3.80	91.60
7	53.455881	-1.231289	90.00	3.80	93.80
8	53.457031	-1.228800	97.30	3.80	101.10
9	53.456833	-1.228542	98.40	3.80	102.20
10	53.455625	-1.231064	90.90	3.80	94.70
11	53.455248	-1.233231	88.10	3.80	91.90
12	53.454096	-1.233596	89.80	3.80	93.60
13	53.454409	-1.232330	90.00	3.80	93.80
14	53.454301	-1.230538	93.40	3.80	97.20
15	53.455464	-1.228188	98.40	3.80	102.20
16	53.456651	-1.226227	103.50	3.80	107.30
17	53.457615	-1.226302	104.50	3.80	108.30
18	53.457890	-1.226034	105.80	3.80	109.60
19	53.458637	-1.226806	103.70	3.80	107.50
20	53.459987	-1.227433	98.50	3.80	102.30

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454007	-1.222055	116.70	3.80	120.50
2	53.454582	-1.215318	126.90	3.80	130.70
3	53.455030	-1.214824	128.20	3.80	132.00
4	53.455413	-1.215167	129.90	3.80	133.70
5	53.456205	-1.215210	132.10	3.80	135.90
6	53.457304	-1.215682	132.20	3.80	136.00
7	53.458390	-1.208451	120.40	3.80	124.20
8	53.459476	-1.208065	122.00	3.80	125.80
9	53.458454	-1.215897	130.70	3.80	134.50
10	53.457432	-1.215597	131.70	3.80	135.50
11	53.456243	-1.219824	133.90	3.80	137.70
12	53.455196	-1.219266	129.10	3.80	132.90
13	53.454595	-1.221562	118.00	3.80	121.80

Flight Path Receptors

Name: 02
Description:
Threshold height: 52 m
Direction: 197.7°
Glide slope: 3.1°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.487616	-0.997740	7.07	52.00	59.07
Two-mile	53.515160	-0.982949	3.00	230.39	233.39

Name: 20
Description:
Threshold height: 26 m
Direction: 17.7°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.463377	-1.010443	19.77	26.00	45.77
Two-mile	53.435833	-1.025226	24.18	190.28	214.46

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	0	0.0	0	0.0	-
PV array 2	25.0	180.0	0	0.0	0	0.0	-
PV array 3	25.0	180.0	0	0.0	0	0.0	-
PV array 4	25.0	180.0	0	0.0	0	0.0	-
PV array 5	25.0	180.0	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV: PV array 1 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 1 and FP: 02

No glare found

PV array 1 and FP: 20

No glare found

PV: PV array 2 no glare found

Receptor results ordered by category of glare

02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 2 and FP: 02

No glare found

PV array 2 and FP: 20

No glare found

PV: PV array 3 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 3 and FP: 02

No glare found

PV array 3 and FP: 20

No glare found

PV: PV array 4 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 4 and FP: 02

No glare found

PV array 4 and FP: 20

No glare found

PV: PV array 5 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 5 and FP: 02

No glare found

PV array 5 and FP: 20

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 1**
Site configuration: **JS W1 - Aviation**

Created 02 Jul, 2025
Updated 26 Nov, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 500 kW to 1 MW
Site ID 153788.25566

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	0	0.0	0	0.0	-
PV array 2	8.0	180.0	0	0.0	0	0.0	-
PV array 3	8.0	180.0	0	0.0	0	0.0	-
PV array 4	8.0	180.0	0	0.0	0	0.0	-
PV array 5	8.0	180.0	0	0.0	0	0.0	-

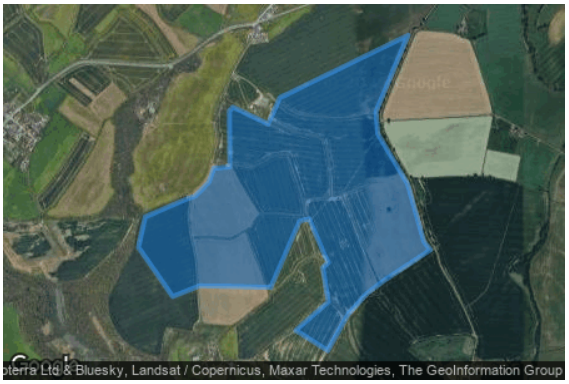
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

Component Data

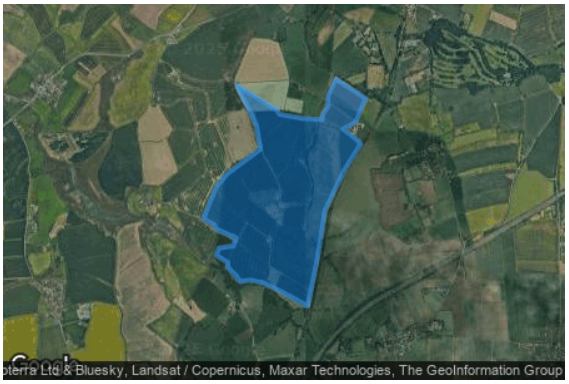
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.462880	-1.242763	80.60	3.80	84.40
2	53.461615	-1.245982	76.30	3.80	80.10
3	53.461117	-1.247097	70.70	3.80	74.50
4	53.460248	-1.248428	70.10	3.80	73.90
5	53.458766	-1.249812	78.70	3.80	82.50
6	53.459596	-1.252011	72.20	3.80	76.00
7	53.460759	-1.249780	66.60	3.80	70.40
8	53.462151	-1.250155	67.40	3.80	71.20
9	53.462362	-1.249769	66.30	3.80	70.10
10	53.462650	-1.250026	65.00	3.80	68.80
11	53.464150	-1.251099	66.70	3.80	70.50
12	53.464047	-1.251754	66.20	3.80	70.00
13	53.461346	-1.253738	60.60	3.80	64.40
14	53.461416	-1.258599	63.50	3.80	67.30
15	53.460975	-1.260476	67.20	3.80	71.00
16	53.462983	-1.262831	82.20	3.80	86.00
17	53.464219	-1.262370	83.30	3.80	87.10
18	53.464950	-1.259516	81.10	3.80	84.90
19	53.465077	-1.258915	80.50	3.80	84.30
20	53.465639	-1.257976	79.10	3.80	82.90
21	53.466204	-1.257649	78.40	3.80	82.20
22	53.466262	-1.256555	76.60	3.80	80.40
23	53.468550	-1.256575	78.50	3.80	82.30
24	53.468697	-1.256344	78.50	3.80	82.30
25	53.468007	-1.253919	78.10	3.80	81.90
26	53.469079	-1.253110	78.90	3.80	82.70
27	53.471629	-1.244293	77.00	3.80	80.80
28	53.468512	-1.246508	83.60	3.80	87.40
29	53.467605	-1.246379	82.70	3.80	86.50
30	53.465556	-1.244326	78.30	3.80	82.10
31	53.463205	-1.243211	79.60	3.80	83.40

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.451858	-1.242251	76.10	3.80	79.90
2	53.452101	-1.243817	77.00	3.80	80.80
3	53.451968	-1.245330	76.40	3.80	80.20
4	53.452365	-1.245780	77.10	3.80	80.90
5	53.453157	-1.247089	73.80	3.80	77.60
6	53.453508	-1.247014	77.60	3.80	81.40
7	53.454133	-1.248632	80.80	3.80	84.60
8	53.454727	-1.248246	84.60	3.80	88.40
9	53.454880	-1.246271	89.30	3.80	93.10
10	53.455544	-1.245960	90.30	3.80	94.10
11	53.456142	-1.248170	86.90	3.80	90.70
12	53.456356	-1.248750	84.00	3.80	87.80
13	53.456595	-1.248900	83.60	3.80	87.40
14	53.457132	-1.250386	76.70	3.80	80.50
15	53.459695	-1.248626	72.60	3.80	76.40
16	53.460821	-1.247009	71.40	3.80	75.20
17	53.462776	-1.242546	80.50	3.80	84.30
18	53.464717	-1.243104	76.10	3.80	79.90
19	53.465886	-1.244037	77.30	3.80	81.10
20	53.467981	-1.245797	82.50	3.80	86.30
21	53.465982	-1.240304	65.80	3.80	69.60
22	53.465631	-1.239928	65.40	3.80	69.20
23	53.465299	-1.236903	62.50	3.80	66.30
24	53.465190	-1.234070	62.90	3.80	66.70
25	53.465573	-1.234006	62.10	3.80	65.90
26	53.466250	-1.233276	60.40	3.80	64.20
27	53.467151	-1.233244	57.90	3.80	61.70
28	53.468498	-1.232139	55.90	3.80	59.70
29	53.466900	-1.228049	68.80	3.80	72.60
30	53.464957	-1.229472	73.50	3.80	77.30
31	53.464421	-1.231172	72.30	3.80	76.10
32	53.464012	-1.230260	76.50	3.80	80.30
33	53.463498	-1.229219	81.20	3.80	85.00
34	53.463171	-1.228764	83.80	3.80	87.60
35	53.461159	-1.230909	82.30	3.80	86.10
36	53.457824	-1.233656	80.90	3.80	84.70
37	53.454042	-1.234665	90.90	3.80	94.70
38	53.449966	-1.236038	96.00	3.80	99.80
39	53.451282	-1.240093	81.60	3.80	85.40
40	53.451947	-1.242432	76.70	3.80	80.50

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.465402	-1.224873	79.20	3.80	83.00
2	53.464182	-1.223639	86.50	3.80	90.30
3	53.463831	-1.223800	88.00	3.80	91.80
4	53.463365	-1.223832	90.80	3.80	94.60
5	53.462553	-1.223071	99.60	3.80	103.40
6	53.462336	-1.225077	95.10	3.80	98.90
7	53.461883	-1.225410	97.70	3.80	101.50
8	53.463959	-1.226901	83.10	3.80	86.90
9	53.465198	-1.225764	78.40	3.80	82.20

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.461091	-1.227555	95.90	3.80	99.70
2	53.461116	-1.230044	85.70	3.80	89.50
3	53.459289	-1.231418	86.80	3.80	90.60
4	53.458484	-1.232072	86.60	3.80	90.40
5	53.457366	-1.232458	86.30	3.80	90.10
6	53.455504	-1.233220	87.80	3.80	91.60
7	53.455881	-1.231289	90.00	3.80	93.80
8	53.457031	-1.228800	97.30	3.80	101.10
9	53.456833	-1.228542	98.40	3.80	102.20
10	53.455625	-1.231064	90.90	3.80	94.70
11	53.455248	-1.233231	88.10	3.80	91.90
12	53.454096	-1.233596	89.80	3.80	93.60
13	53.454409	-1.232330	90.00	3.80	93.80
14	53.454301	-1.230538	93.40	3.80	97.20
15	53.455464	-1.228188	98.40	3.80	102.20
16	53.456651	-1.226227	103.50	3.80	107.30
17	53.457615	-1.226302	104.50	3.80	108.30
18	53.457890	-1.226034	105.80	3.80	109.60
19	53.458637	-1.226806	103.70	3.80	107.50
20	53.459987	-1.227433	98.50	3.80	102.30

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.454007	-1.222055	116.70	3.80	120.50
2	53.454582	-1.215318	126.90	3.80	130.70
3	53.455030	-1.214824	128.20	3.80	132.00
4	53.455413	-1.215167	129.90	3.80	133.70
5	53.456205	-1.215210	132.10	3.80	135.90
6	53.457304	-1.215682	132.20	3.80	136.00
7	53.458390	-1.208451	120.40	3.80	124.20
8	53.459476	-1.208065	122.00	3.80	125.80
9	53.458454	-1.215897	130.70	3.80	134.50
10	53.457432	-1.215597	131.70	3.80	135.50
11	53.456243	-1.219824	133.90	3.80	137.70
12	53.455196	-1.219266	129.10	3.80	132.90
13	53.454595	-1.221562	118.00	3.80	121.80

Flight Path Receptors

Name: 02
Description:
Threshold height: 52 m
Direction: 197.7°
Glide slope: 3.1°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.487616	-0.997740	7.07	52.00	59.07
Two-mile	53.515160	-0.982949	3.00	230.39	233.39

Name: 20
Description:
Threshold height: 26 m
Direction: 17.7°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.463377	-1.010443	19.77	26.00	45.77
Two-mile	53.435833	-1.025226	24.18	190.28	214.46

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	0	0.0	0	0.0	-
PV array 2	8.0	180.0	0	0.0	0	0.0	-
PV array 3	8.0	180.0	0	0.0	0	0.0	-
PV array 4	8.0	180.0	0	0.0	0	0.0	-
PV array 5	8.0	180.0	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV: PV array 1 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 1 and FP: 02

No glare found

PV array 1 and FP: 20

No glare found

PV: PV array 2 no glare found

Receptor results ordered by category of glare

02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 2 and FP: 02

No glare found

PV array 2 and FP: 20

No glare found

PV: PV array 3 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 3 and FP: 02

No glare found

PV array 3 and FP: 20

No glare found

PV: PV array 4 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 4 and FP: 02

No glare found

PV array 4 and FP: 20

No glare found

PV: PV array 5 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 5 and FP: 02

No glare found

PV array 5 and FP: 20

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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1.2 Whitestone 2

W2 Area	OP No. in Glare Analysis	Residential Receptor No.
A	1	1
A	2	2
A	3	3
A	4	4
A	5	5
A	6	6
A	7	7
A	8	8
A	9	9
A	10	10
A	11	11
A	12	12
A	13	13
A	14	14
A	15	15
A	16	16
A	17	17
B	1	18
B	2	19
B	3	20
B	4	21
B	5	22
B	6	23
B	7	24
B	8	25
B	9	26
B	10	27
B	11	28
B	12	29
B	13	30
B	14	31
B	15	32
B	16	33
C	1	34
C	2	35

C	3	36
C	4	37
C	5	38
C	6	39
C	7	40
C	8	41
C	9	42
C	10	43
C	11	44
C	12	45
C	13	46
C	14	47
C	15	48
C	16	49
C	17	50
C	18	51
C	19	52
C	20	53
C	21	22
C	22	54
C	23	55
C	24	56
C	25	57
C	26	58
C	27	59
C	28	60
C	29	61
C	30	62
C	31	21
C	32	20
C	33	19
C	34	63
C	35	18
C	36	64
C	37	65
D	1	66
D	2	67
D	3	68
D	4	69
D	5	70
D	6	71

D	7	72
D	8	73
D	9	74
D	10	75
D	11	76
D	12	77
D	13	78
D	14	79
D	15	80
D	16	81
D	17	82
D	18	83
D	19	84
D	20	43
D	21	42
D	22	85
D	23	41
D	24	40
D	25	86
D	26	37
D	27	39
D	28	38
D	29	36
D	30	35
E	1	87
E	2	88
E	3	89
E	4	90
E	5	91
E	6	92
E	7	93
E	8	94
E	9	95
E	10	96
E	11	97
E	12	98
E	13	99
E	14	100
E	15	101
E	16	102
E	17	103

E	18	104
E	19	105
E	20	106
E	21	107
E	22	82
E	23	81
E	24	79
E	25	78
E	26	80
E	27	77
E	28	76
E	29	75

W2A

FORGESOLAR GLARE ANALYSIS

Project: **Whitestone**
Site configuration: **W2A**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 153694.25317

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 18	8.0	180.0	11,896	198.3	14,721	245.3	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 1	1,468	24.5	31	0.5
OP 2	1,905	31.8	1,705	28.4
OP 3	34	0.6	0	0.0
OP 4	124	2.1	0	0.0
OP 5	468	7.8	0	0.0
OP 6	1,481	24.7	417	7.0
OP 7	623	10.4	2,238	37.3
OP 8	617	10.3	2,851	47.5
OP 9	1,016	16.9	1,138	19.0
OP 10	604	10.1	2,396	39.9
OP 11	1,073	17.9	259	4.3
OP 12	0	0.0	0	0.0
OP 13	106	1.8	0	0.0
OP 14	826	13.8	776	12.9

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 15	756	12.6	691	11.5
OP 16	795	13.2	2,219	37.0
OP 17	0	0.0	0	0.0

Component Data

PV Arrays

Name: WS2 - 18
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414444	-1.260646	123.50	3.80	127.30
2	53.414636	-1.256162	117.80	3.80	121.60
3	53.412360	-1.257256	110.30	3.80	114.10
4	53.412296	-1.258758	110.10	3.80	113.90
5	53.412587	-1.258753	112.20	3.80	116.00
6	53.412596	-1.259868	113.90	3.80	117.70
7	53.412782	-1.260957	113.20	3.80	117.00
8	53.412790	-1.261171	112.50	3.80	116.30
9	53.412785	-1.261278	112.10	3.80	115.90
10	53.412784	-1.261332	112.00	3.80	115.80
11	53.412783	-1.261390	111.90	3.80	115.70
12	53.412782	-1.261455	111.80	3.80	115.60
13	53.412782	-1.261521	111.70	3.80	115.50
14	53.412772	-1.261623	111.60	3.80	115.40
15	53.412766	-1.261767	111.50	3.80	115.30
16	53.412711	-1.262105	110.60	3.80	114.40
17	53.412922	-1.262854	111.30	3.80	115.10
18	53.413012	-1.263656	111.80	3.80	115.60
19	53.412747	-1.263758	110.50	3.80	114.30
20	53.412309	-1.263543	109.10	3.80	112.90
21	53.411807	-1.263699	107.70	3.80	111.50
22	53.411477	-1.264294	108.80	3.80	112.60
23	53.411170	-1.264337	108.10	3.80	111.90
24	53.411036	-1.264380	107.60	3.80	111.40
25	53.410902	-1.264262	107.50	3.80	111.30
26	53.410473	-1.262041	110.90	3.80	114.70
27	53.410275	-1.260174	109.40	3.80	113.20
28	53.410991	-1.259766	108.40	3.80	112.20
29	53.410850	-1.259573	106.80	3.80	110.60
30	53.410953	-1.259337	105.80	3.80	109.60
31	53.410633	-1.258565	107.80	3.80	111.60
32	53.410096	-1.258844	107.60	3.80	111.40
33	53.409584	-1.259037	110.50	3.80	114.30
34	53.408650	-1.261333	119.80	3.80	123.60
35	53.408248	-1.262395	121.80	3.80	125.60
36	53.407026	-1.263028	127.60	3.80	131.40
37	53.407179	-1.263994	128.30	3.80	132.10
38	53.407359	-1.264959	127.50	3.80	131.30
39	53.407382	-1.266640	127.90	3.80	131.70
40	53.408021	-1.266940	123.10	3.80	126.90
41	53.410605	-1.267573	111.20	3.80	115.00
42	53.410605	-1.267627	111.30	3.80	115.10
43	53.410880	-1.267530	110.70	3.80	114.50
44	53.410874	-1.267455	110.50	3.80	114.30
45	53.410874	-1.267445	110.40	3.80	114.20
46	53.411641	-1.267466	112.70	3.80	116.50
47	53.411807	-1.264548	110.60	3.80	114.40
48	53.414161	-1.264827	117.40	3.80	121.20
49	53.414391	-1.260986	122.70	3.80	126.50
50	53.414397	-1.260986	122.70	3.80	126.50
51	53.414442	-1.260653	123.50	3.80	127.30

Route Receptors

Name: Route 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414593	-1.255743	114.00	1.50	115.50
2	53.412905	-1.256515	112.50	1.50	114.00
3	53.411114	-1.257331	111.70	1.50	113.20
4	53.409430	-1.258351	112.80	1.50	114.30
5	53.407677	-1.259413	115.50	1.50	117.00
6	53.405951	-1.260700	117.10	1.50	118.60
7	53.404454	-1.261816	118.20	1.50	119.70
8	53.402765	-1.263104	114.70	1.50	116.20
9	53.400539	-1.264949	112.10	1.50	113.60

Name: Route 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.411666	-1.275767	124.40	1.50	125.90
2	53.410003	-1.274694	129.40	1.50	130.90
3	53.408136	-1.274608	125.50	1.50	127.00
4	53.406268	-1.274737	124.30	1.50	125.80
5	53.404493	-1.274699	118.50	1.50	120.00
6	53.403099	-1.274345	117.80	1.50	119.30
7	53.402344	-1.271609	117.90	1.50	119.40
8	53.401634	-1.268798	116.30	1.50	117.80
9	53.400521	-1.265140	111.60	1.50	113.10

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.413284	-1.251933	113.80	2.00
OP 2	2	53.412306	-1.260012	112.30	2.00
OP 3	3	53.413178	-1.273009	122.00	2.00
OP 4	4	53.412826	-1.274200	118.70	2.00
OP 5	5	53.412199	-1.273578	117.30	2.00
OP 6	6	53.411617	-1.271775	116.80	2.00
OP 7	7	53.410172	-1.272151	123.70	2.00
OP 8	8	53.408982	-1.272108	125.80	2.00
OP 9	9	53.408599	-1.268932	120.70	2.00
OP 10	10	53.407105	-1.272341	123.39	2.00
OP 11	11	53.404867	-1.271311	122.90	2.00
OP 12	12	53.403307	-1.268439	121.60	2.00
OP 13	13	53.402875	-1.274859	118.30	2.00
OP 14	14	53.404602	-1.277874	119.00	2.00
OP 15	15	53.404372	-1.275342	119.90	2.00
OP 16	16	53.406546	-1.270911	124.90	2.00
OP 17	17	53.400694	-1.255485	124.10	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 18	8.0	180.0	11,896	198.3	14,721	245.3	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 1	1,468	24.5	31	0.5
OP 2	1,905	31.8	1,705	28.4
OP 3	34	0.6	0	0.0
OP 4	124	2.1	0	0.0
OP 5	468	7.8	0	0.0
OP 6	1,481	24.7	417	7.0
OP 7	623	10.4	2,238	37.3
OP 8	617	10.3	2,851	47.5
OP 9	1,016	16.9	1,138	19.0
OP 10	604	10.1	2,396	39.9
OP 11	1,073	17.9	259	4.3
OP 12	0	0.0	0	0.0
OP 13	106	1.8	0	0.0
OP 14	826	13.8	776	12.9
OP 15	756	12.6	691	11.5
OP 16	795	13.2	2,219	37.0
OP 17	0	0.0	0	0.0

PV: WS2 - 18 potential temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 1	1,468	24.5	31	0.5
OP 2	1,905	31.8	1,705	28.4
OP 6	1,481	24.7	417	7.0
OP 7	623	10.4	2,238	37.3
OP 8	617	10.3	2,851	47.5
OP 9	1,016	16.9	1,138	19.0
OP 10	604	10.1	2,396	39.9
OP 11	1,073	17.9	259	4.3
OP 14	826	13.8	776	12.9
OP 15	756	12.6	691	11.5
OP 16	795	13.2	2,219	37.0
OP 3	34	0.6	0	0.0
OP 4	124	2.1	0	0.0
OP 5	468	7.8	0	0.0
OP 13	106	1.8	0	0.0
OP 12	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

WS2 - 18 and Route: Route 1

No glare found

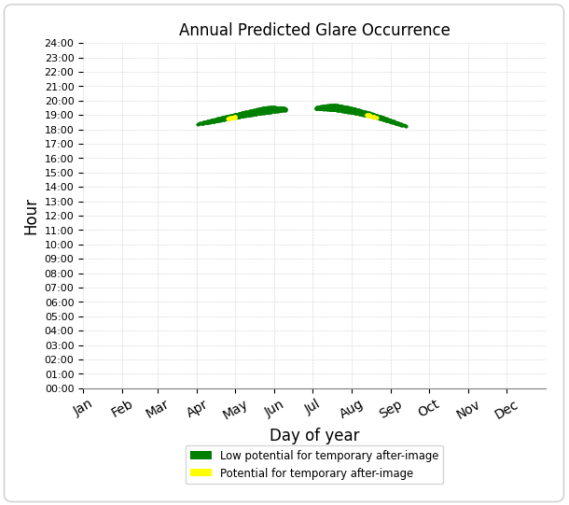
WS2 - 18 and Route: Route 2

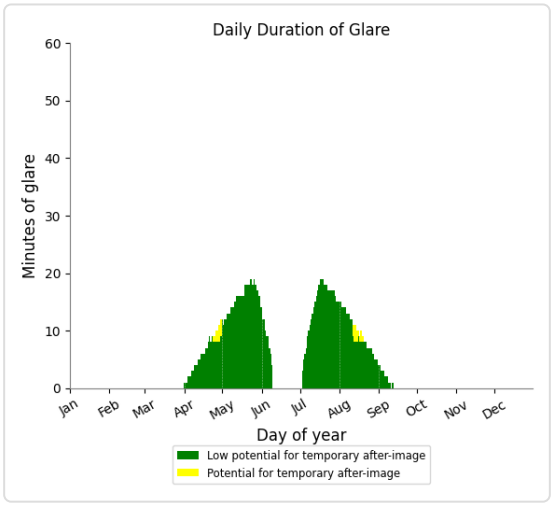
No glare found

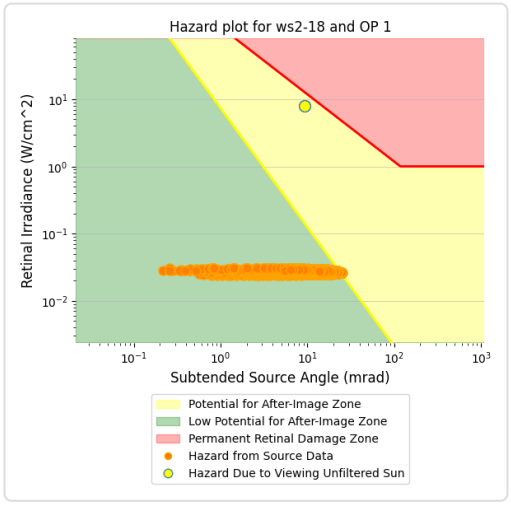
WS2 - 18 and OP 1

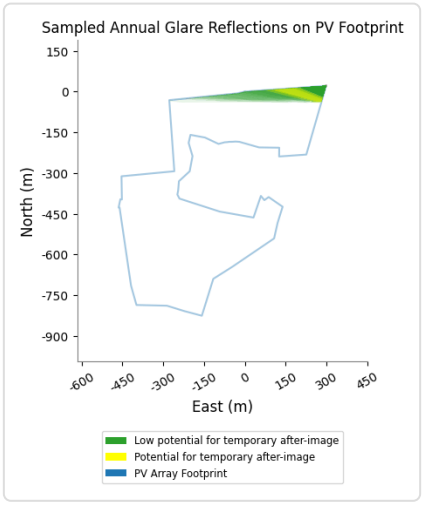
Yellow glare: 31 min.

Green glare: 1,468 min.





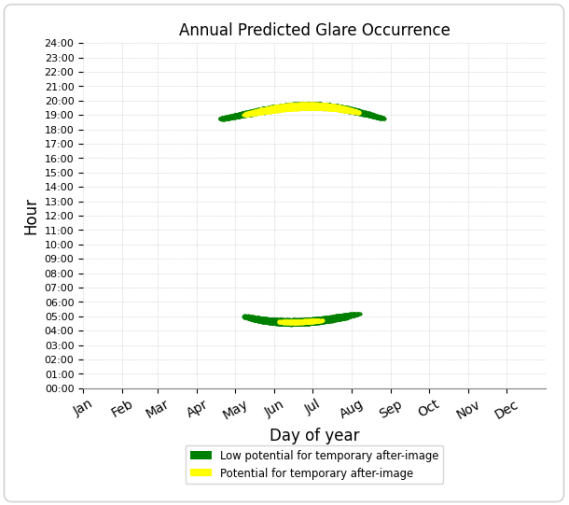


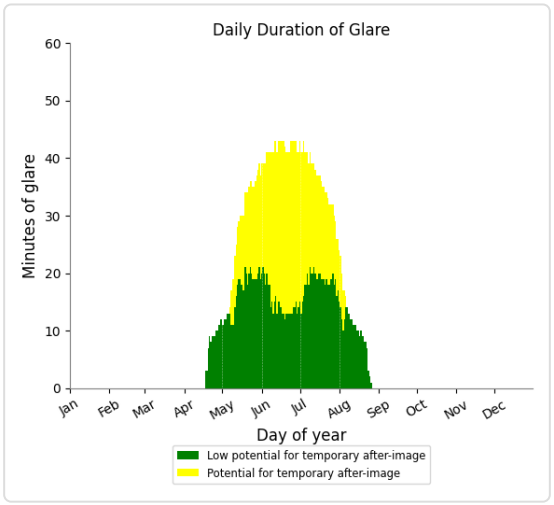


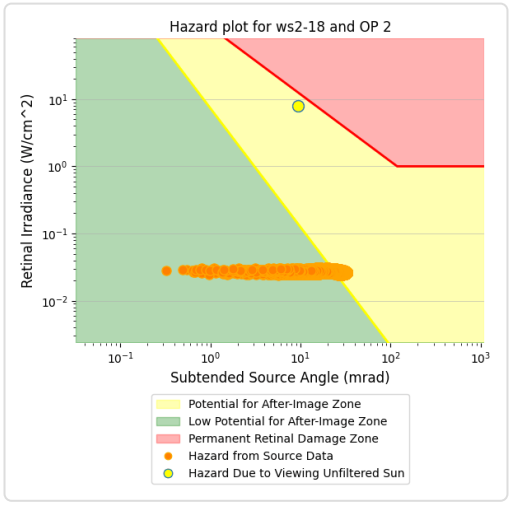
WS2 - 18 and OP 2

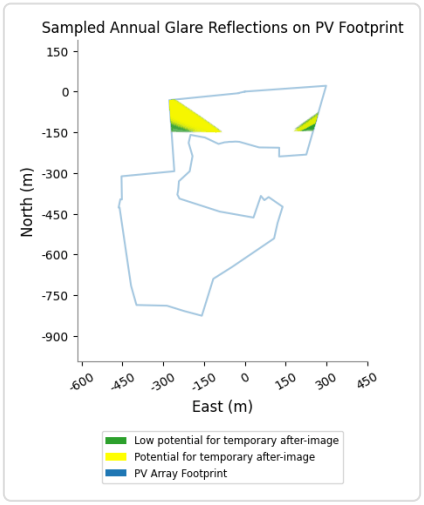
Yellow glare: 1,705 min.

Green glare: 1,905 min.





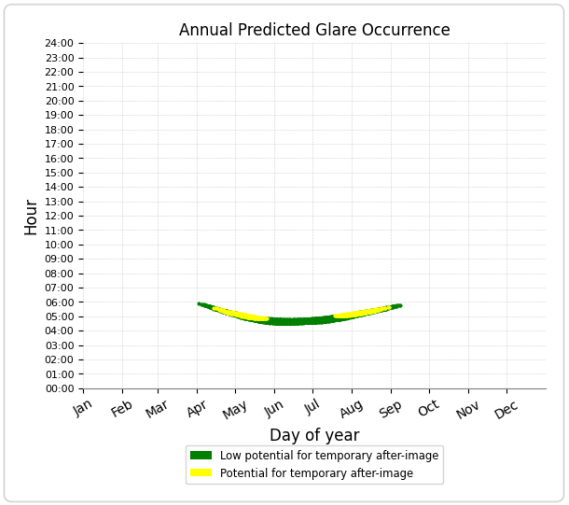


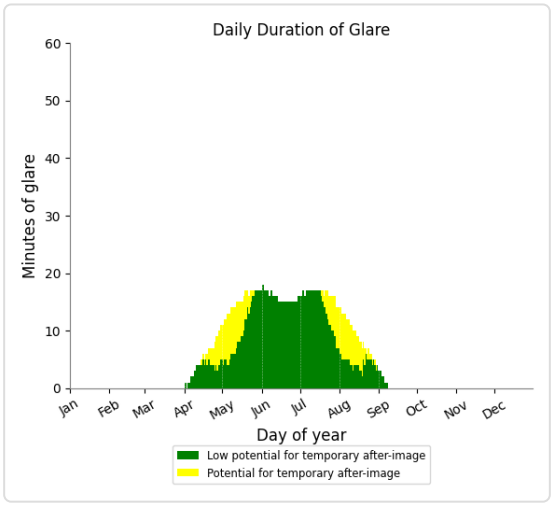


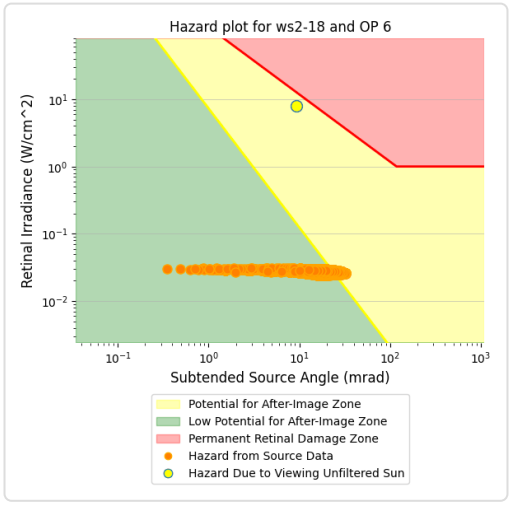
WS2 - 18 and OP 6

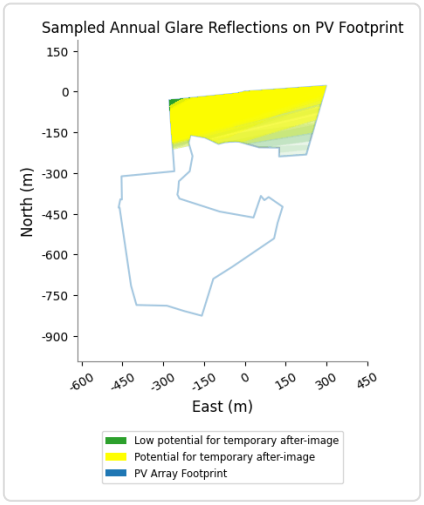
Yellow glare: 417 min.

Green glare: 1,481 min.





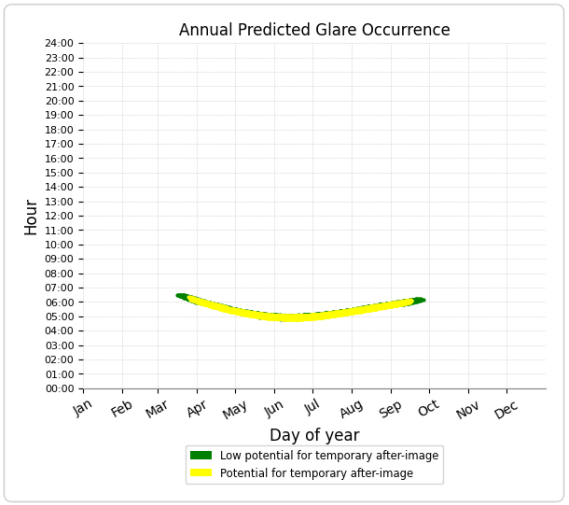


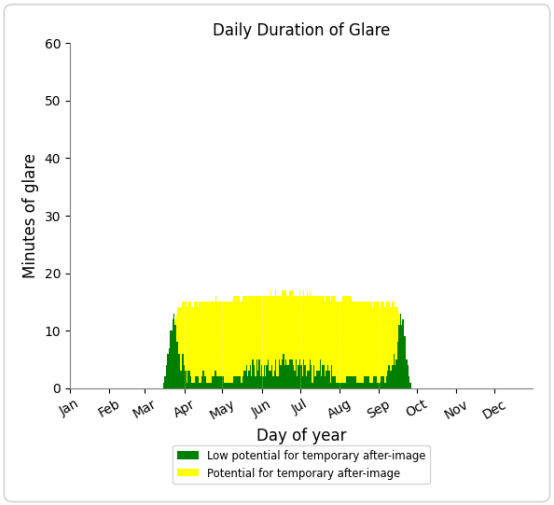


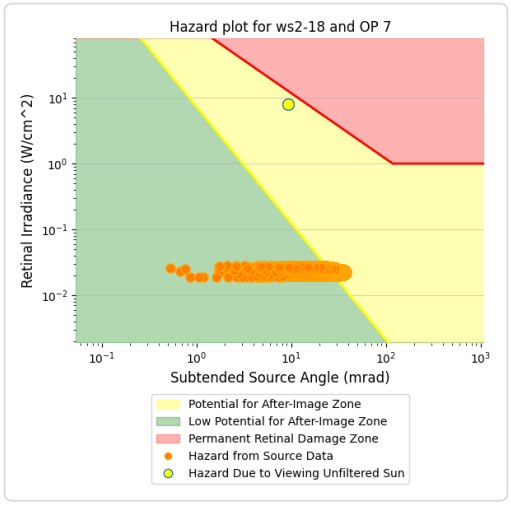
WS2 - 18 and OP 7

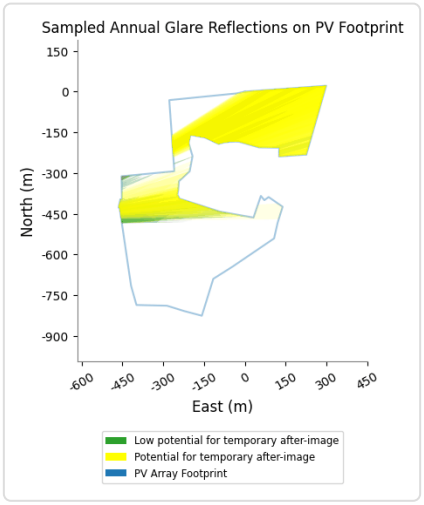
Yellow glare: 2,238 min.

Green glare: 623 min.





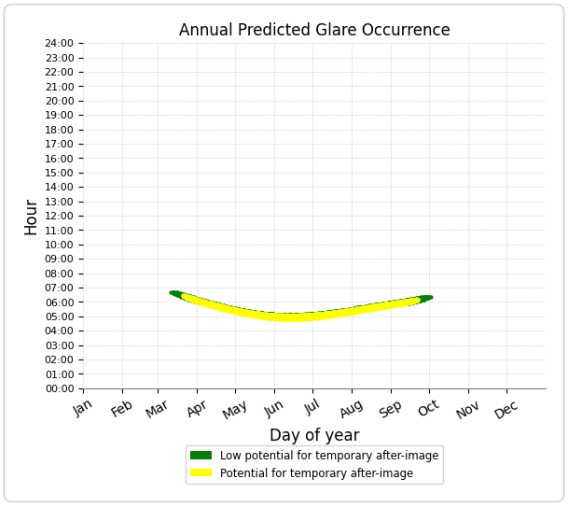


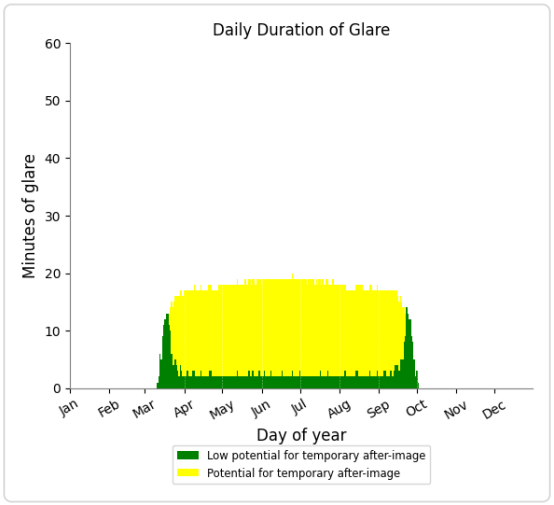


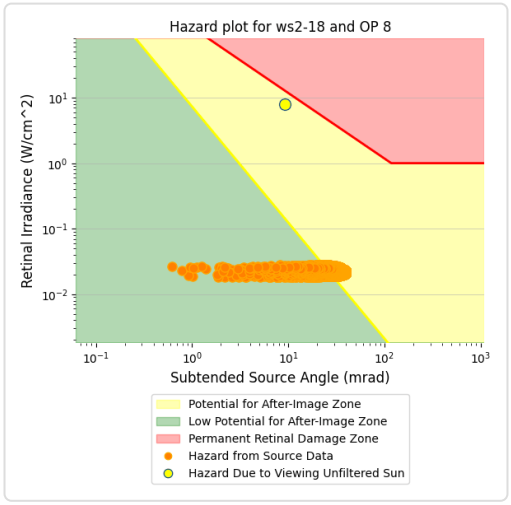
WS2 - 18 and OP 8

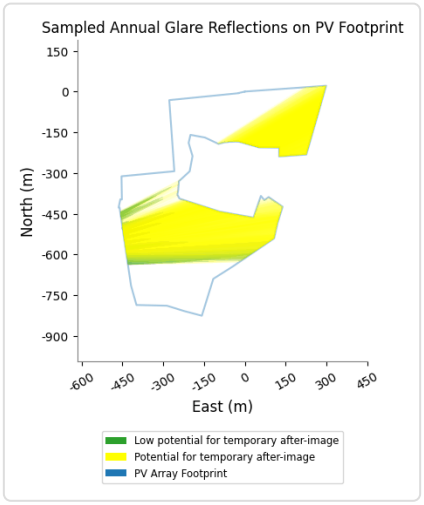
Yellow glare: 2,851 min.

Green glare: 617 min.





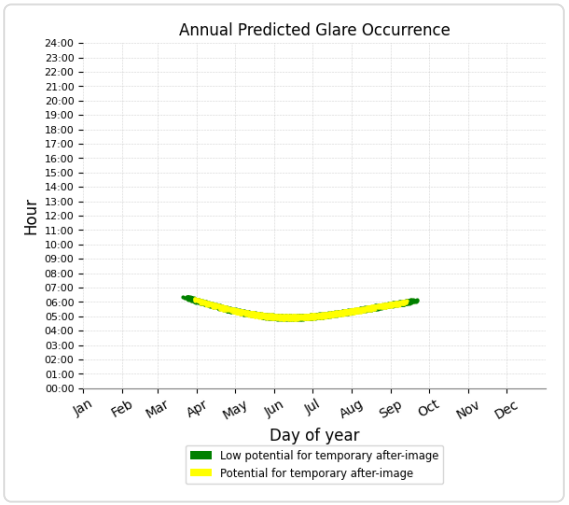


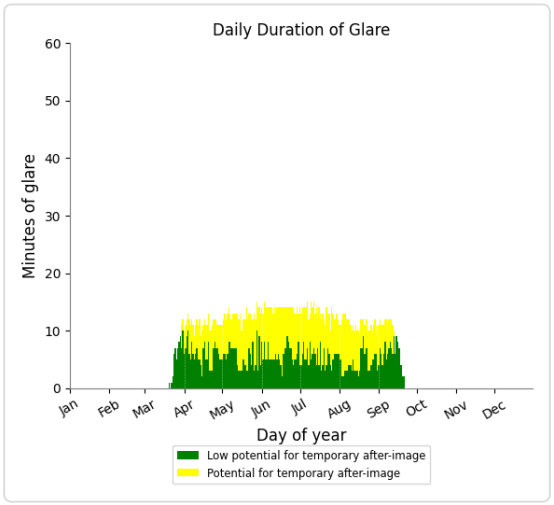


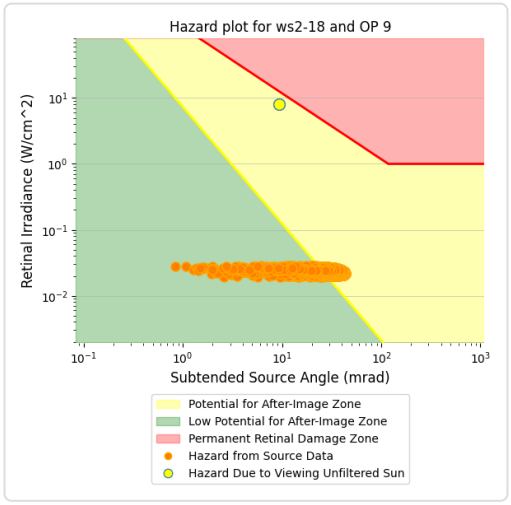
WS2 - 18 and OP 9

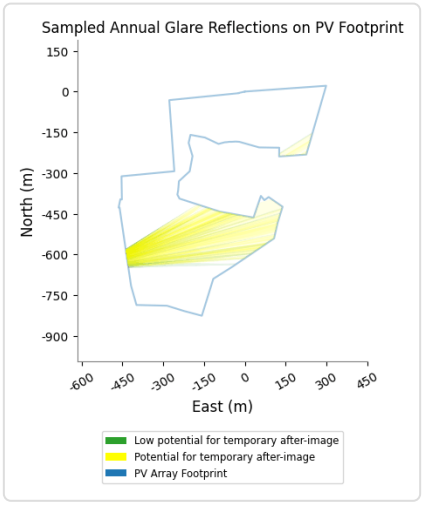
Yellow glare: 1,138 min.

Green glare: 1,016 min.





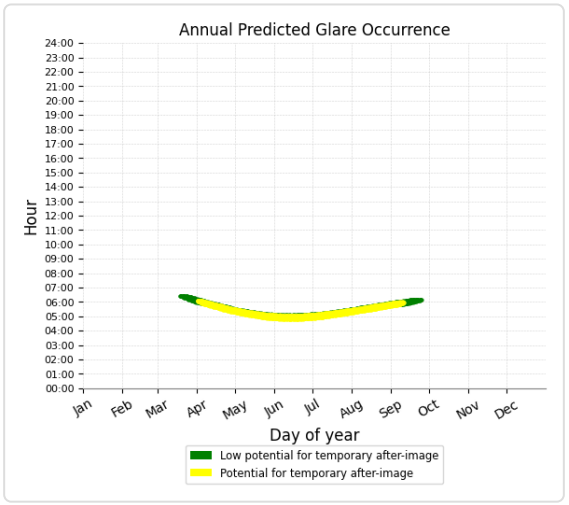


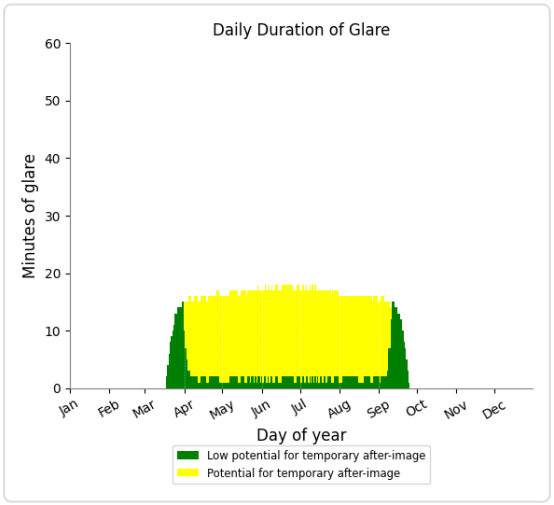


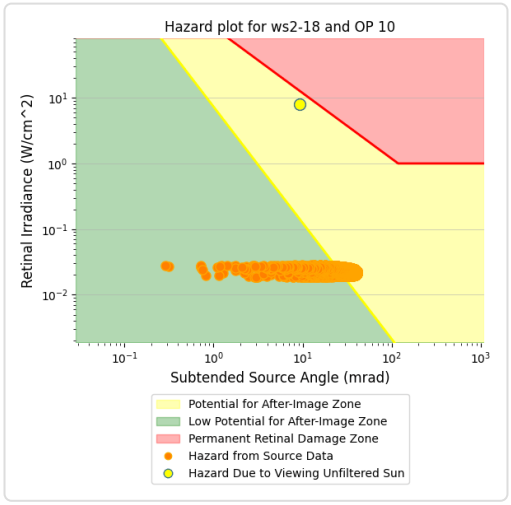
WS2 - 18 and OP 10

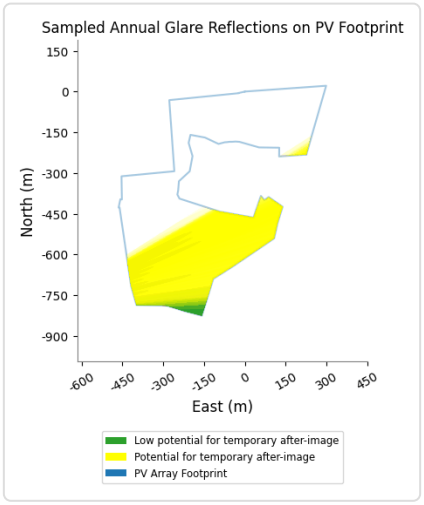
Yellow glare: 2,396 min.

Green glare: 604 min.





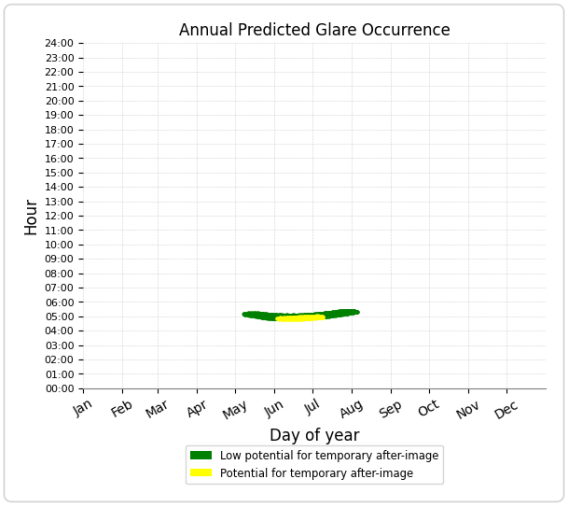


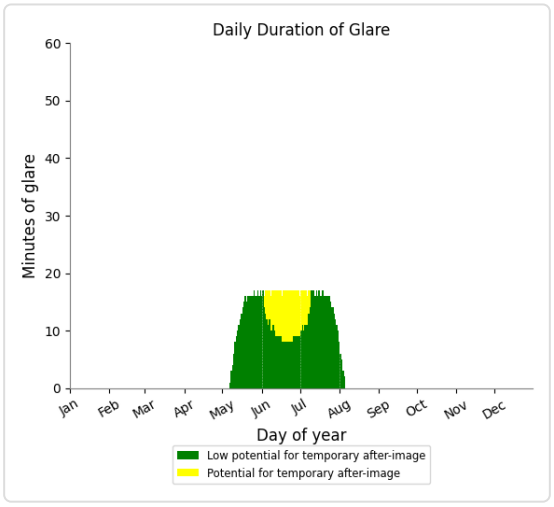


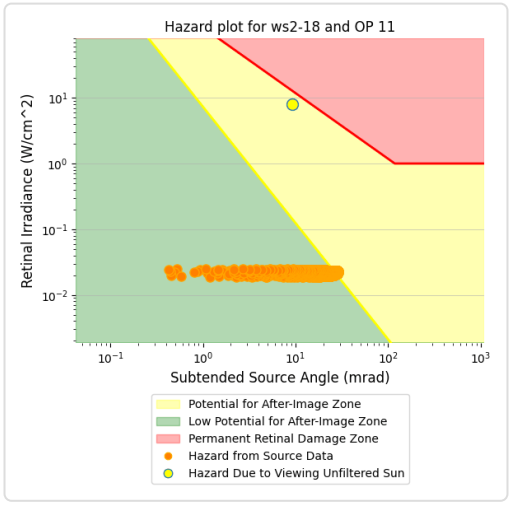
WS2 - 18 and OP 11

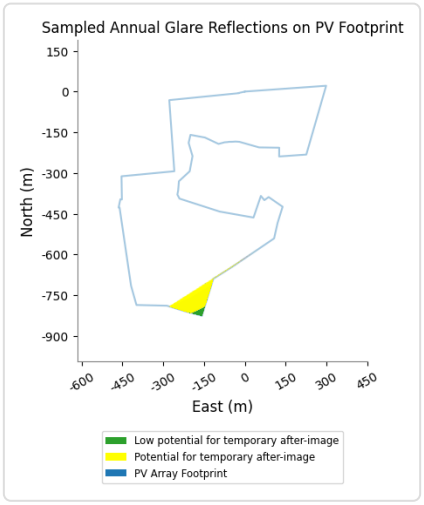
Yellow glare: 259 min.

Green glare: 1,073 min.





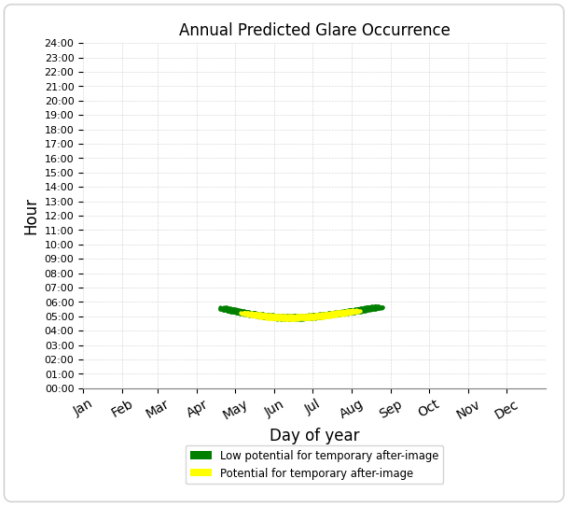


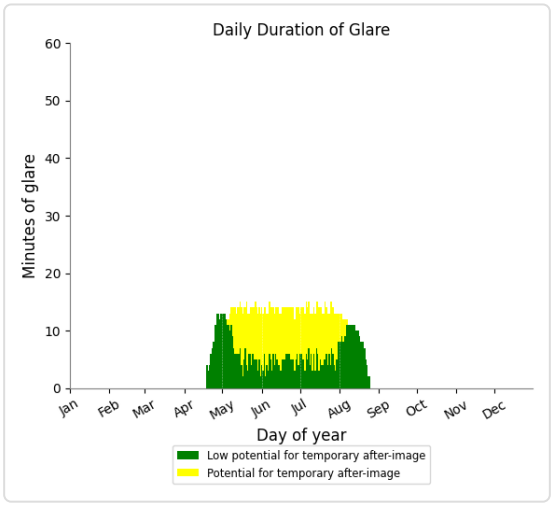


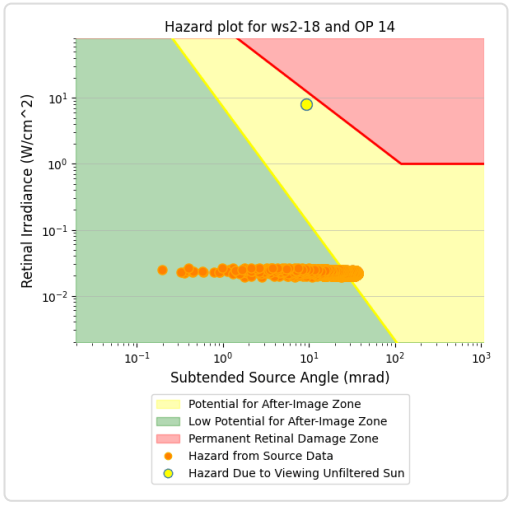
WS2 - 18 and OP 14

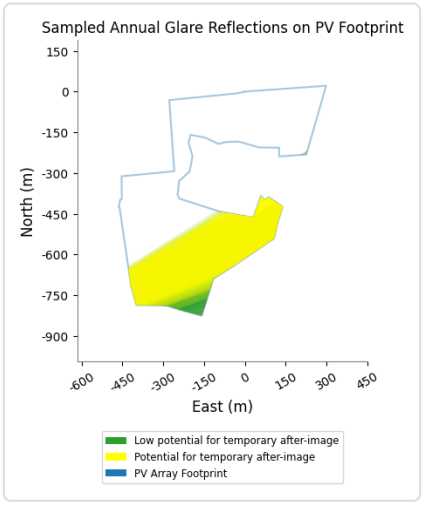
Yellow glare: 776 min.

Green glare: 826 min.





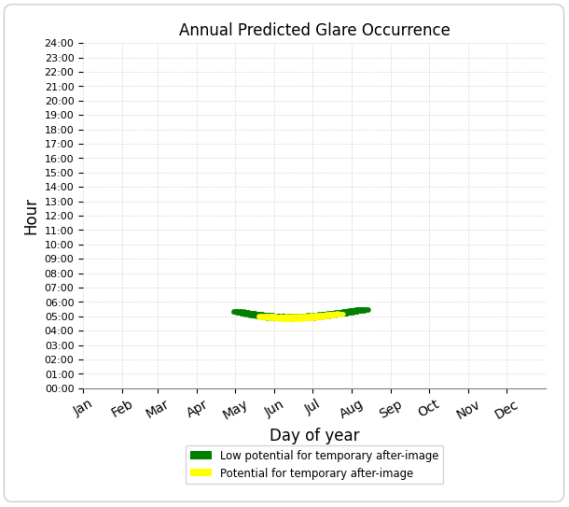


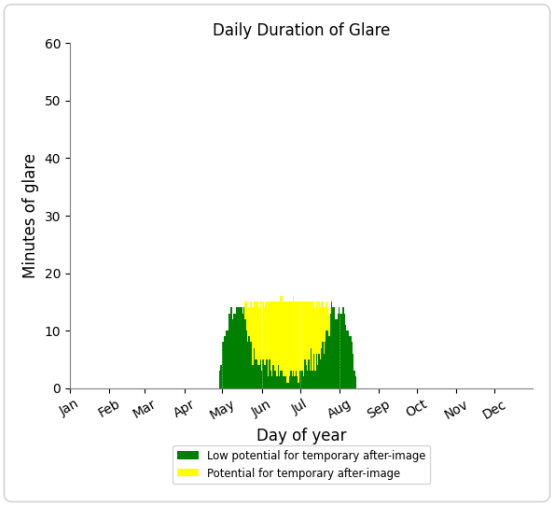


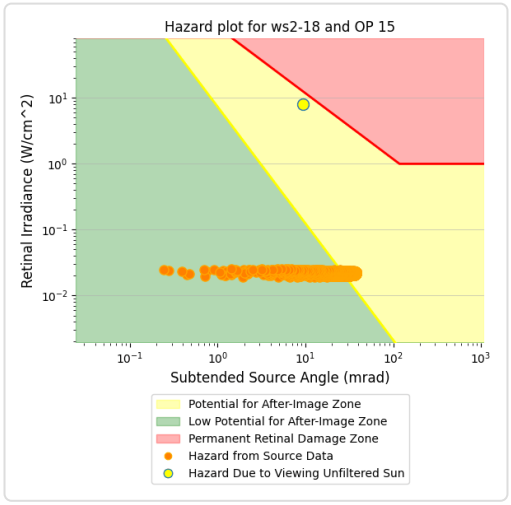
WS2 - 18 and OP 15

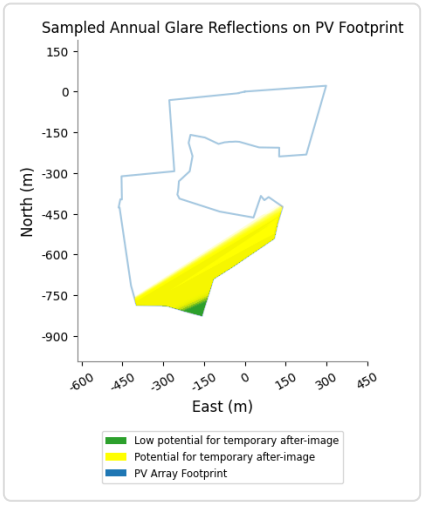
Yellow glare: 691 min.

Green glare: 756 min.





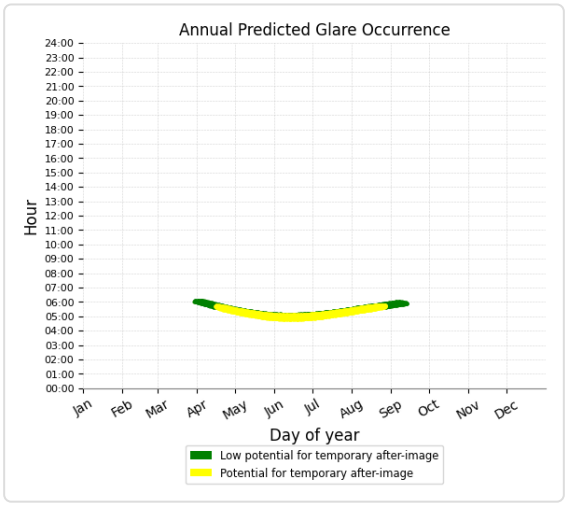


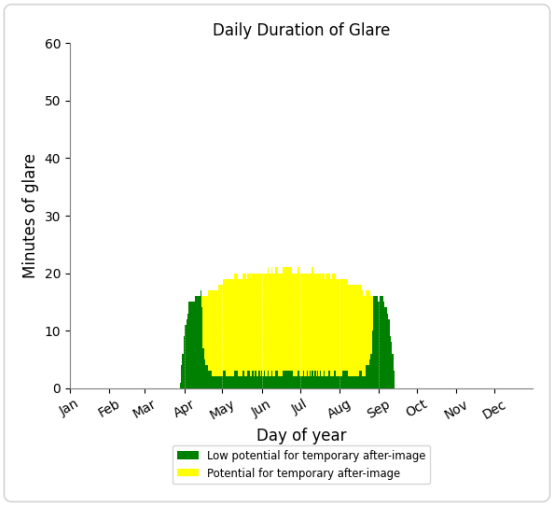


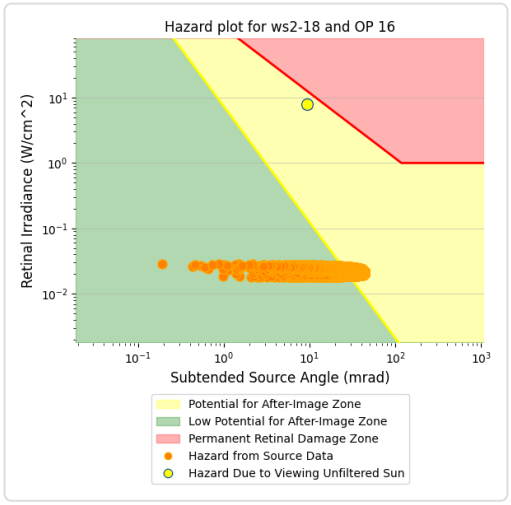
WS2 - 18 and OP 16

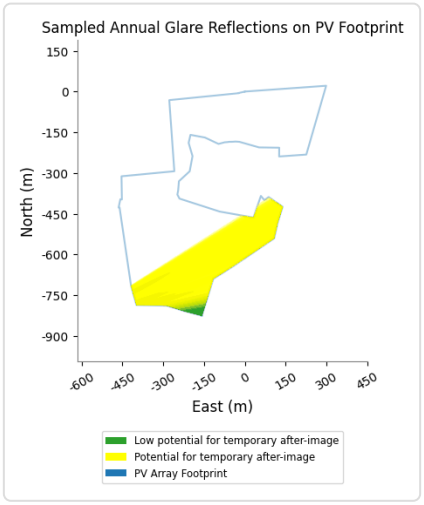
Yellow glare: 2,219 min.

Green glare: 795 min.





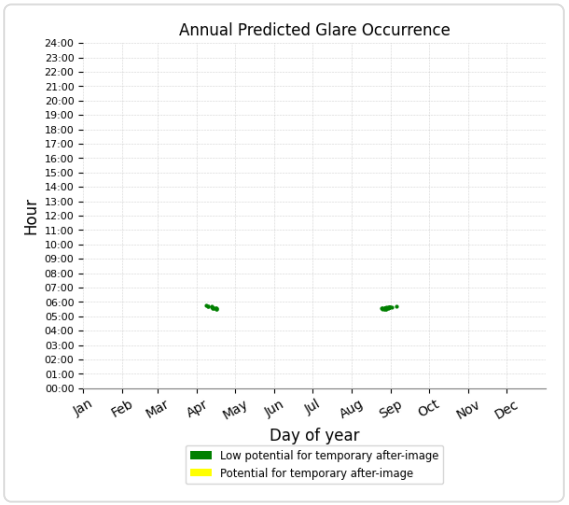


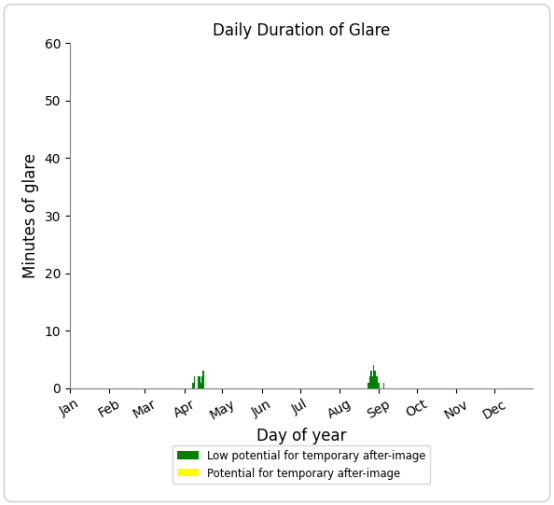


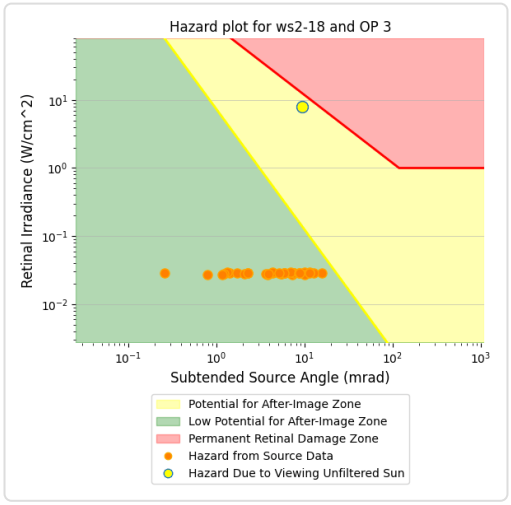
WS2 - 18 and OP 3

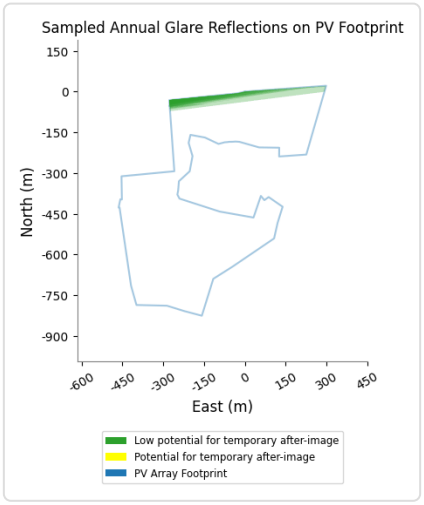
Yellow glare: none

Green glare: 34 min.





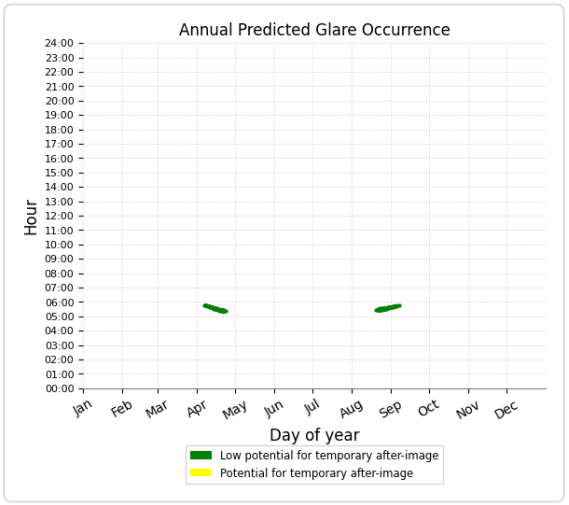


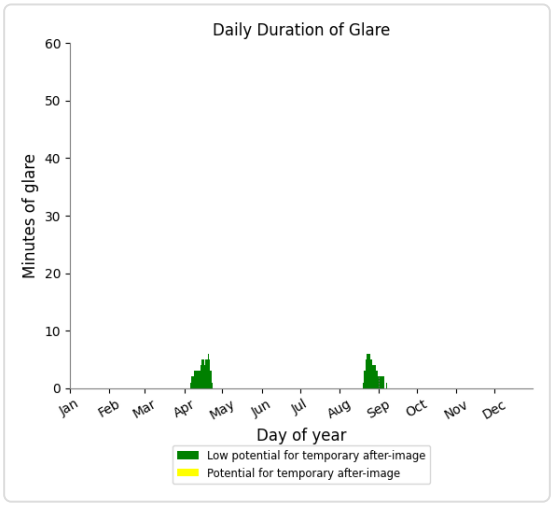


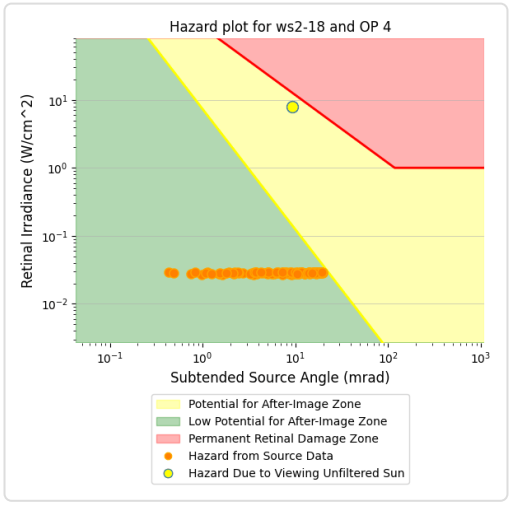
WS2 - 18 and OP 4

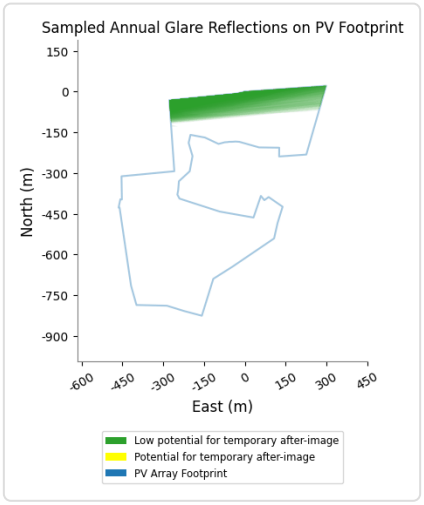
Yellow glare: none

Green glare: 124 min.





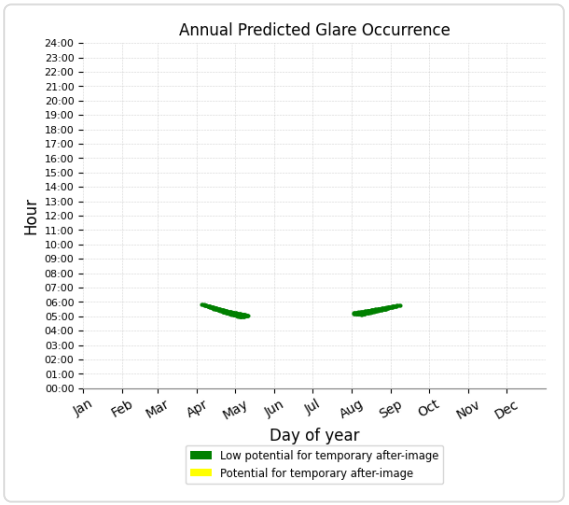


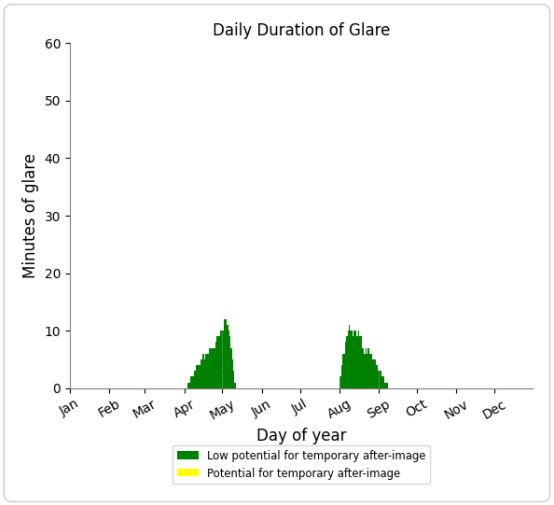


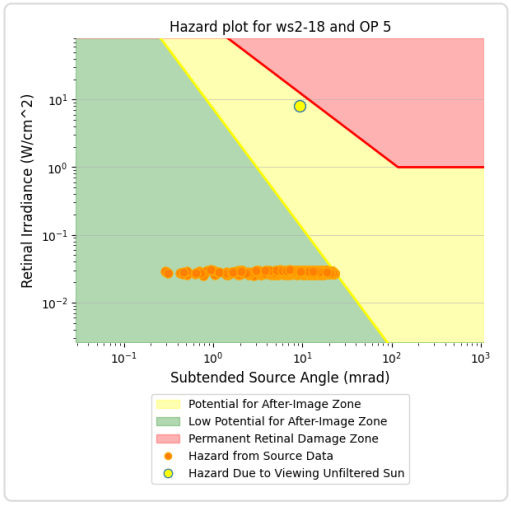
WS2 - 18 and OP 5

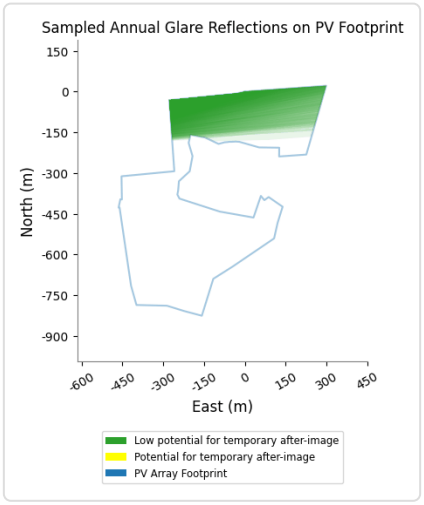
Yellow glare: none

Green glare: 468 min.





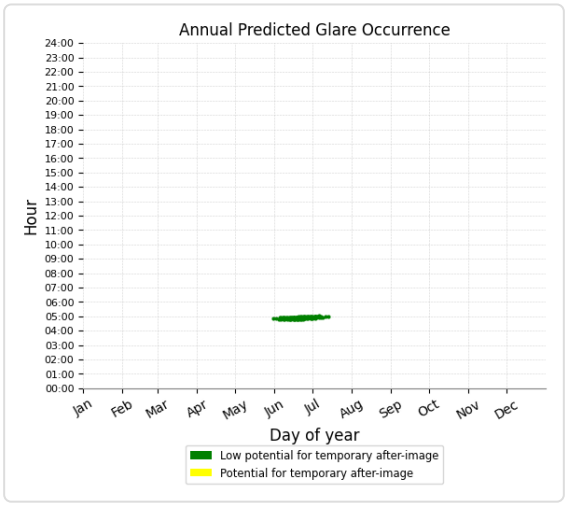


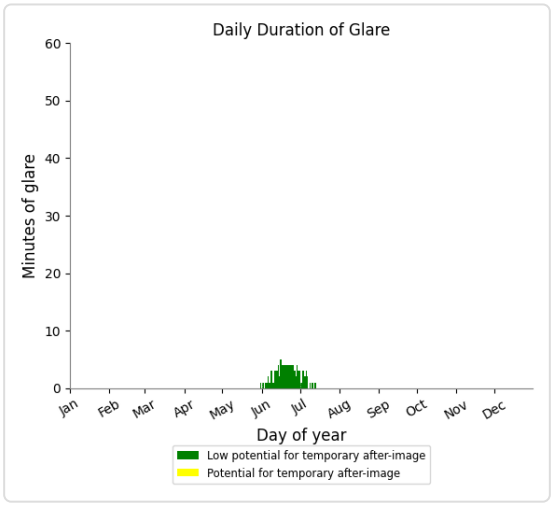


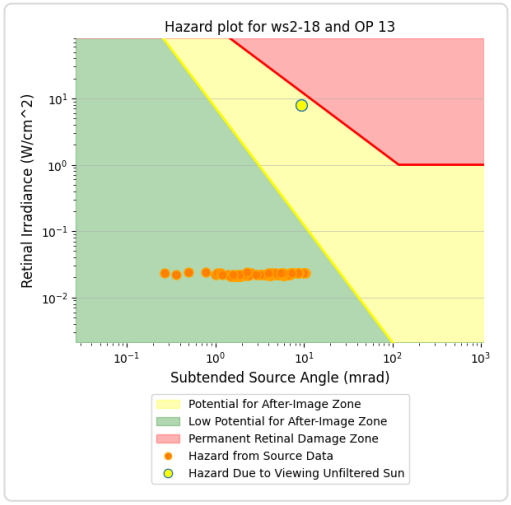
WS2 - 18 and OP 13

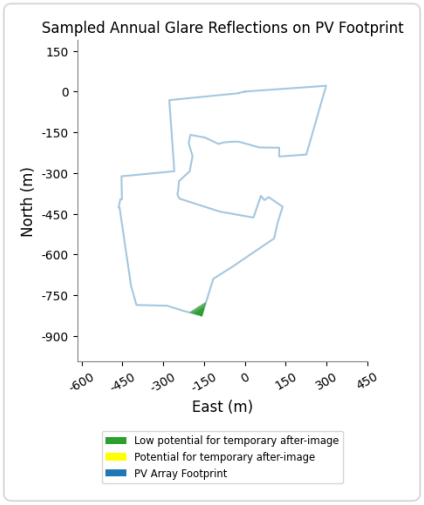
Yellow glare: none

Green glare: 106 min.









WS2 - 18 and OP 12

No glare found

WS2 - 18 and OP 17

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone**
Site configuration: **W2A**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 153694.25317

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 18	25.0	180.0	9,831	163.8	19,538	325.6	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 1	697	11.6	2,185	36.4
OP 2	2,636	43.9	5,847	97.5
OP 3	268	4.5	41	0.7
OP 4	367	6.1	250	4.2
OP 5	846	14.1	589	9.8
OP 6	412	6.9	1,562	26.0
OP 7	377	6.3	1,875	31.2
OP 8	435	7.2	2,199	36.6
OP 9	658	11.0	985	16.4
OP 10	460	7.7	1,916	31.9
OP 11	534	8.9	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	673	11.2	378	6.3

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 15	831	13.8	0	0.0
OP 16	637	10.6	1,711	28.5
OP 17	0	0.0	0	0.0

Component Data

PV Arrays

Name: WS2 - 18
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414444	-1.260646	123.50	3.80	127.30
2	53.414636	-1.256162	117.80	3.80	121.60
3	53.412360	-1.257256	110.30	3.80	114.10
4	53.412296	-1.258758	110.10	3.80	113.90
5	53.412587	-1.258753	112.20	3.80	116.00
6	53.412596	-1.259868	113.90	3.80	117.70
7	53.412782	-1.260957	113.20	3.80	117.00
8	53.412790	-1.261171	112.50	3.80	116.30
9	53.412785	-1.261278	112.10	3.80	115.90
10	53.412784	-1.261332	112.00	3.80	115.80
11	53.412783	-1.261390	111.90	3.80	115.70
12	53.412782	-1.261455	111.80	3.80	115.60
13	53.412782	-1.261521	111.70	3.80	115.50
14	53.412772	-1.261623	111.60	3.80	115.40
15	53.412766	-1.261767	111.50	3.80	115.30
16	53.412711	-1.262105	110.60	3.80	114.40
17	53.412922	-1.262854	111.30	3.80	115.10
18	53.413012	-1.263656	111.80	3.80	115.60
19	53.412747	-1.263758	110.50	3.80	114.30
20	53.412309	-1.263543	109.10	3.80	112.90
21	53.411807	-1.263699	107.70	3.80	111.50
22	53.411477	-1.264294	108.80	3.80	112.60
23	53.411170	-1.264337	108.10	3.80	111.90
24	53.411036	-1.264380	107.60	3.80	111.40
25	53.410902	-1.264262	107.50	3.80	111.30
26	53.410473	-1.262041	110.90	3.80	114.70
27	53.410275	-1.260174	109.40	3.80	113.20
28	53.410991	-1.259766	108.40	3.80	112.20
29	53.410850	-1.259573	106.80	3.80	110.60
30	53.410953	-1.259337	105.80	3.80	109.60
31	53.410633	-1.258565	107.80	3.80	111.60
32	53.410096	-1.258844	107.60	3.80	111.40
33	53.409584	-1.259037	110.50	3.80	114.30
34	53.408650	-1.261333	119.80	3.80	123.60
35	53.408248	-1.262395	121.80	3.80	125.60
36	53.407026	-1.263028	127.60	3.80	131.40
37	53.407179	-1.263994	128.30	3.80	132.10
38	53.407359	-1.264959	127.50	3.80	131.30
39	53.407382	-1.266640	127.90	3.80	131.70
40	53.408021	-1.266940	123.10	3.80	126.90
41	53.410605	-1.267573	111.20	3.80	115.00
42	53.410605	-1.267627	111.30	3.80	115.10
43	53.410880	-1.267530	110.70	3.80	114.50
44	53.410874	-1.267455	110.50	3.80	114.30
45	53.410874	-1.267445	110.40	3.80	114.20
46	53.411641	-1.267466	112.70	3.80	116.50
47	53.411807	-1.264548	110.60	3.80	114.40
48	53.414161	-1.264827	117.40	3.80	121.20
49	53.414391	-1.260986	122.70	3.80	126.50
50	53.414397	-1.260986	122.70	3.80	126.50
51	53.414442	-1.260653	123.50	3.80	127.30

Route Receptors

Name: Route 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414593	-1.255743	114.00	1.50	115.50
2	53.412905	-1.256515	112.50	1.50	114.00
3	53.411114	-1.257331	111.70	1.50	113.20
4	53.409430	-1.258351	112.80	1.50	114.30
5	53.407677	-1.259413	115.50	1.50	117.00
6	53.405951	-1.260700	117.10	1.50	118.60
7	53.404454	-1.261816	118.20	1.50	119.70
8	53.402765	-1.263104	114.70	1.50	116.20
9	53.400539	-1.264949	112.10	1.50	113.60

Name: Route 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.411666	-1.275767	124.40	1.50	125.90
2	53.410003	-1.274694	129.40	1.50	130.90
3	53.408136	-1.274608	125.50	1.50	127.00
4	53.406268	-1.274737	124.30	1.50	125.80
5	53.404493	-1.274699	118.50	1.50	120.00
6	53.403099	-1.274345	117.80	1.50	119.30
7	53.402344	-1.271609	117.90	1.50	119.40
8	53.401634	-1.268798	116.30	1.50	117.80
9	53.400521	-1.265140	111.60	1.50	113.10

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.413284	-1.251933	113.80	2.00
OP 2	2	53.412306	-1.260012	112.30	2.00
OP 3	3	53.413178	-1.273009	122.00	2.00
OP 4	4	53.412826	-1.274200	118.70	2.00
OP 5	5	53.412199	-1.273578	117.30	2.00
OP 6	6	53.411617	-1.271775	116.80	2.00
OP 7	7	53.410172	-1.272151	123.70	2.00
OP 8	8	53.408982	-1.272108	125.80	2.00
OP 9	9	53.408599	-1.268932	120.70	2.00
OP 10	10	53.407105	-1.272341	123.39	2.00
OP 11	11	53.404867	-1.271311	122.90	2.00
OP 12	12	53.403307	-1.268439	121.60	2.00
OP 13	13	53.402875	-1.274859	118.30	2.00
OP 14	14	53.404602	-1.277874	119.00	2.00
OP 15	15	53.404372	-1.275342	119.90	2.00
OP 16	16	53.406546	-1.270911	124.90	2.00
OP 17	17	53.400694	-1.255485	124.10	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 18	25.0	180.0	9,831	163.8	19,538	325.6	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 1	697	11.6	2,185	36.4
OP 2	2,636	43.9	5,847	97.5
OP 3	268	4.5	41	0.7
OP 4	367	6.1	250	4.2
OP 5	846	14.1	589	9.8
OP 6	412	6.9	1,562	26.0
OP 7	377	6.3	1,875	31.2
OP 8	435	7.2	2,199	36.6
OP 9	658	11.0	985	16.4
OP 10	460	7.7	1,916	31.9
OP 11	534	8.9	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	673	11.2	378	6.3
OP 15	831	13.8	0	0.0
OP 16	637	10.6	1,711	28.5
OP 17	0	0.0	0	0.0

PV: WS2 - 18 potential temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 1	697	11.6	2,185	36.4
OP 2	2,636	43.9	5,847	97.5
OP 3	268	4.5	41	0.7
OP 4	367	6.1	250	4.2
OP 5	846	14.1	589	9.8
OP 6	412	6.9	1,562	26.0
OP 7	377	6.3	1,875	31.2
OP 8	435	7.2	2,199	36.6
OP 9	658	11.0	985	16.4
OP 10	460	7.7	1,916	31.9
OP 14	673	11.2	378	6.3
OP 16	637	10.6	1,711	28.5
OP 11	534	8.9	0	0.0
OP 15	831	13.8	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

WS2 - 18 and Route: Route 1

No glare found

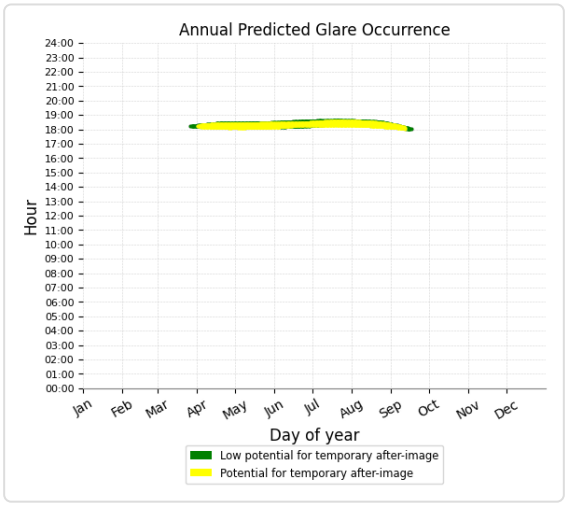
WS2 - 18 and Route: Route 2

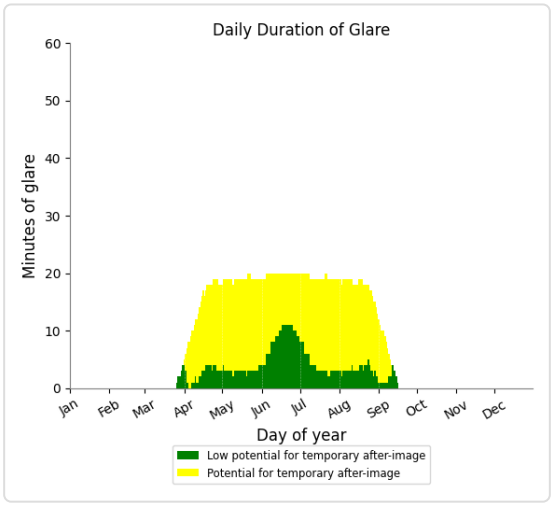
No glare found

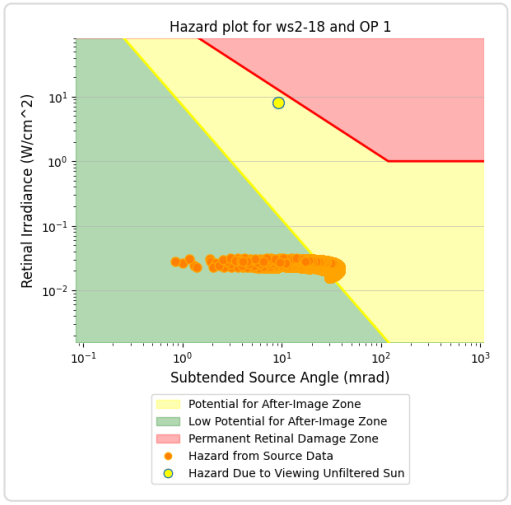
WS2 - 18 and OP 1

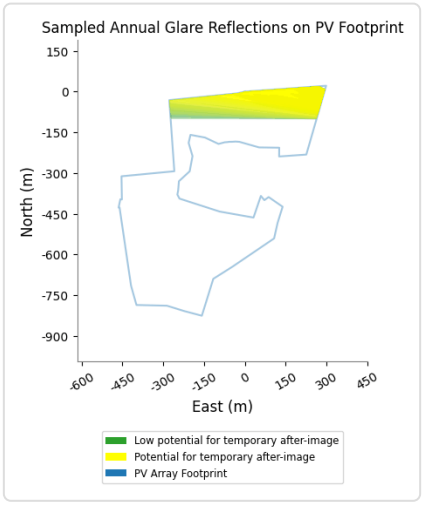
Yellow glare: 2,185 min.

Green glare: 697 min.





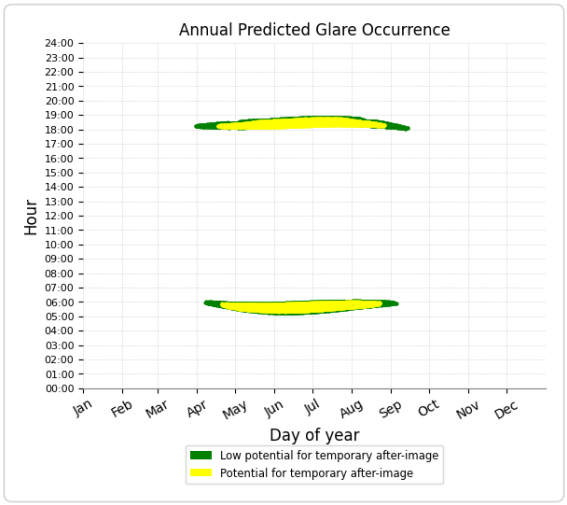


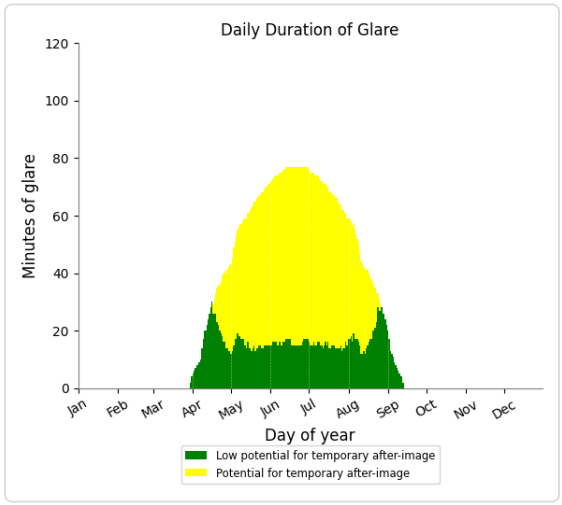


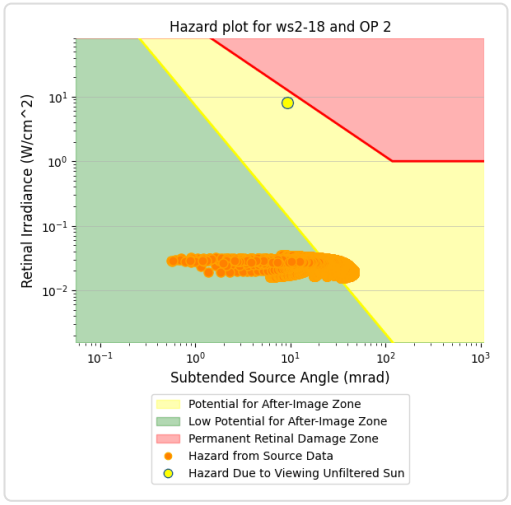
WS2 - 18 and OP 2

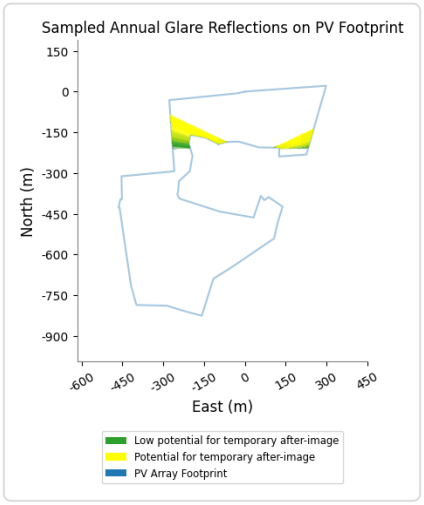
Yellow glare: 5,847 min.

Green glare: 2,636 min.





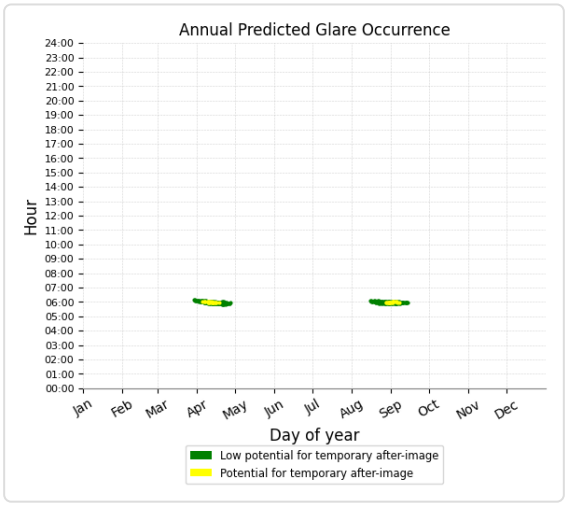


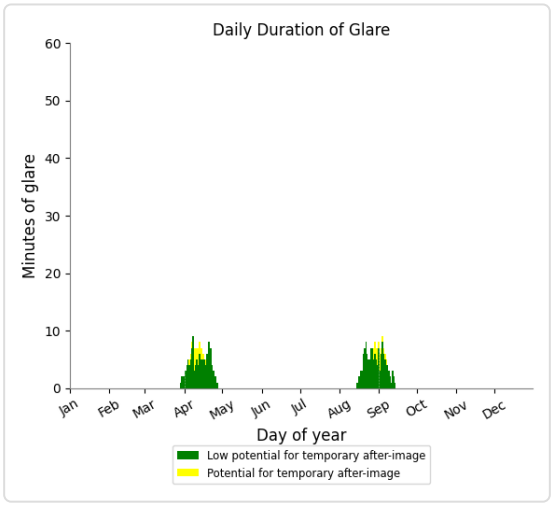


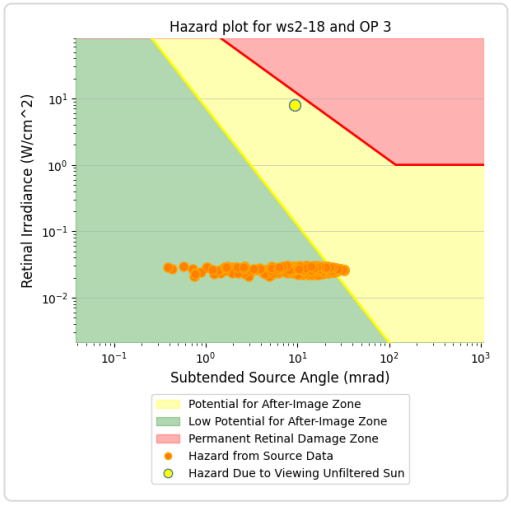
WS2 - 18 and OP 3

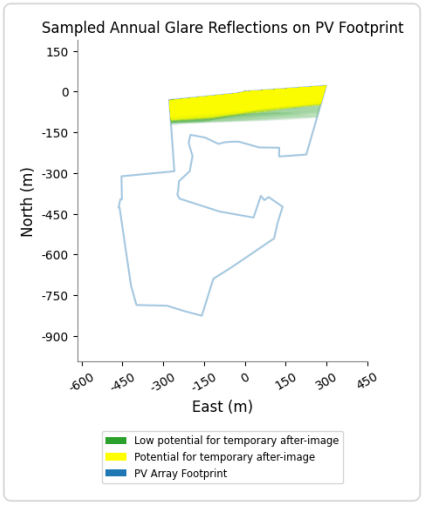
Yellow glare: 41 min.

Green glare: 268 min.





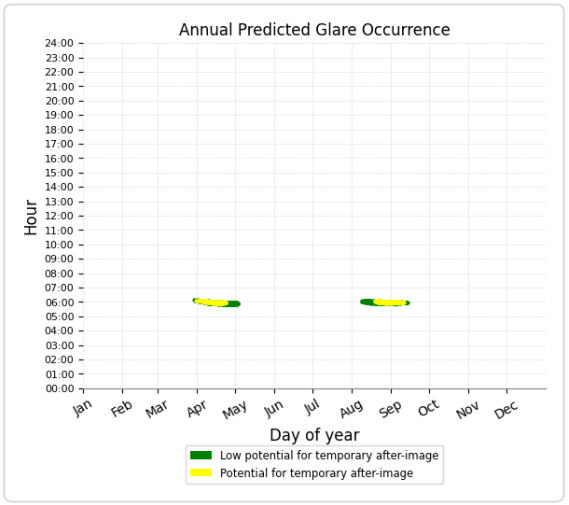


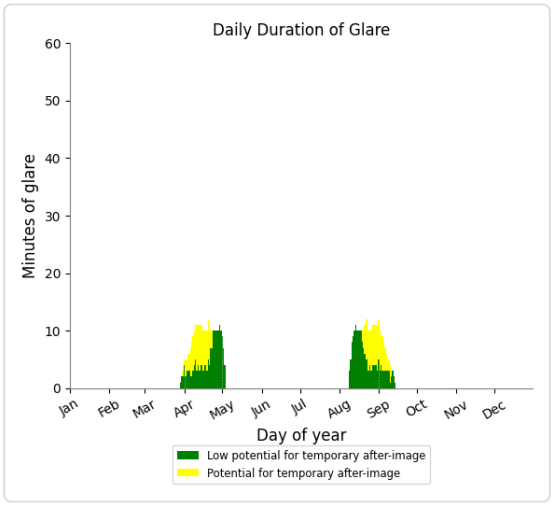


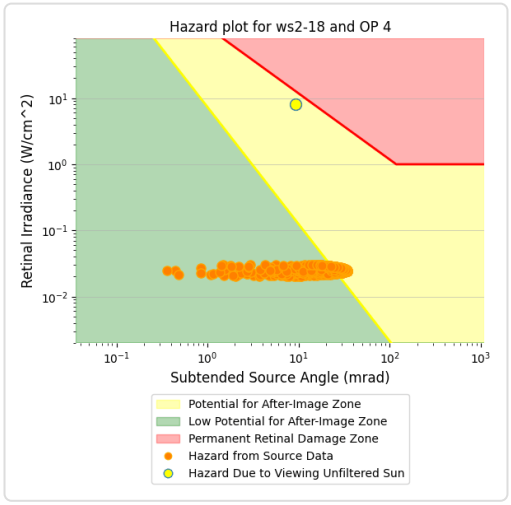
WS2 - 18 and OP 4

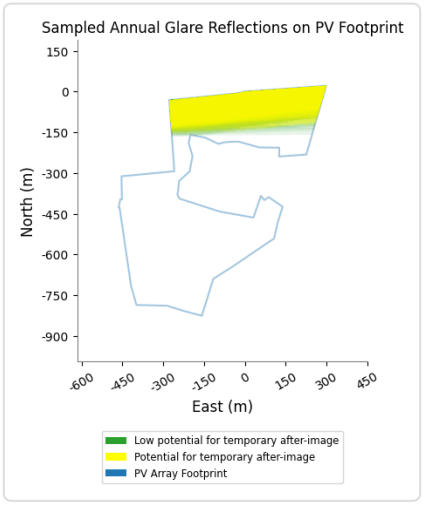
Yellow glare: 250 min.

Green glare: 367 min.





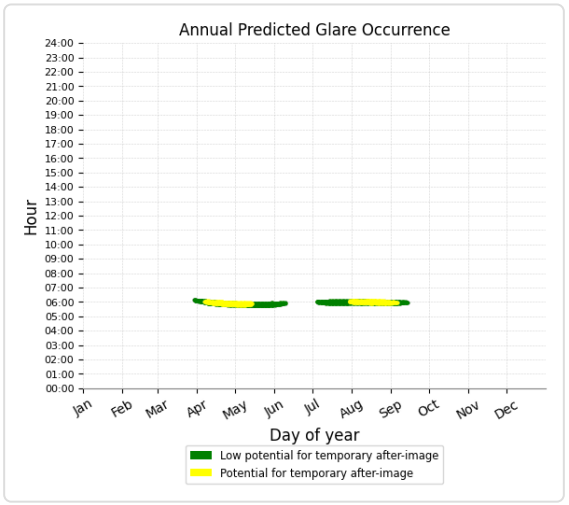


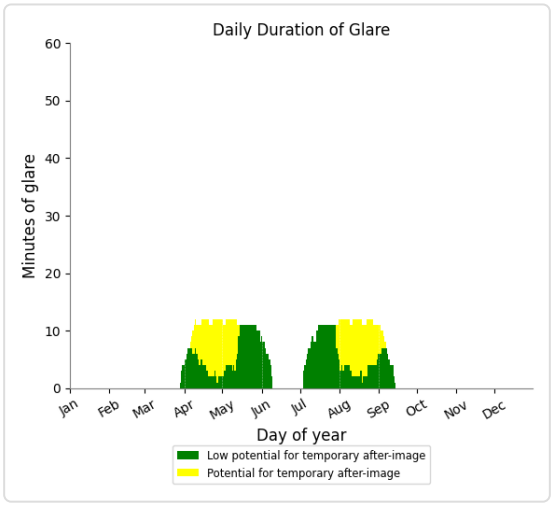


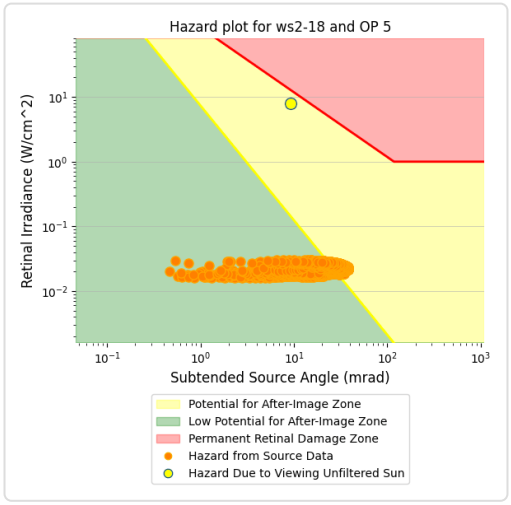
WS2 - 18 and OP 5

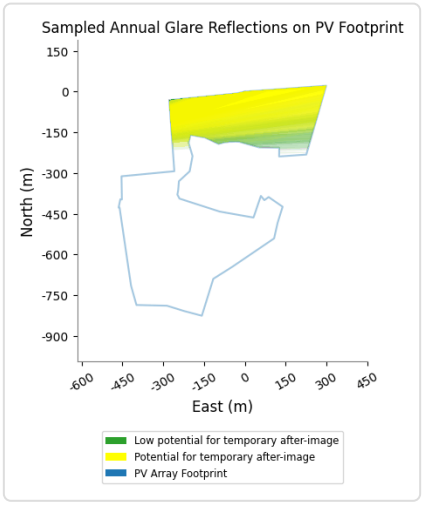
Yellow glare: 589 min.

Green glare: 846 min.





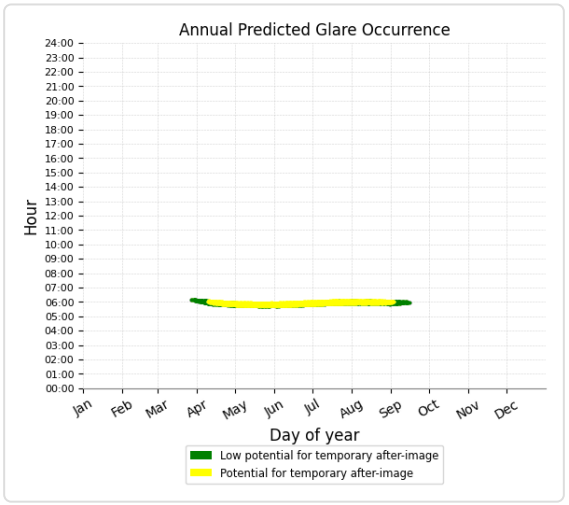


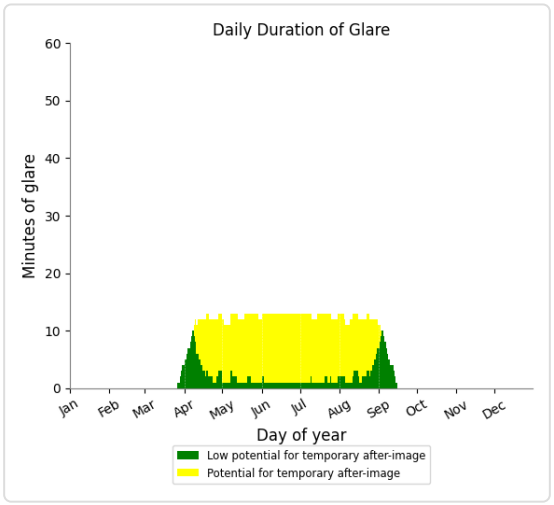


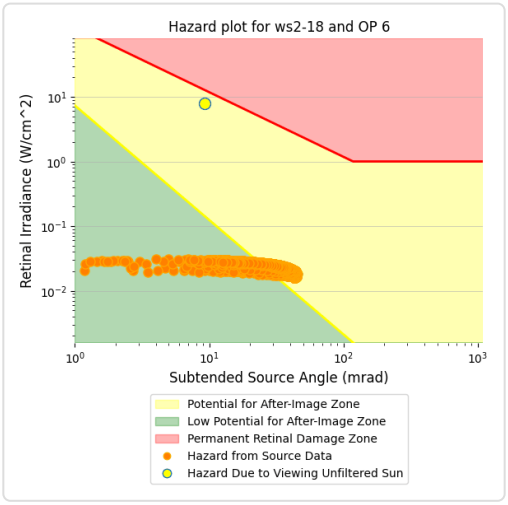
WS2 - 18 and OP 6

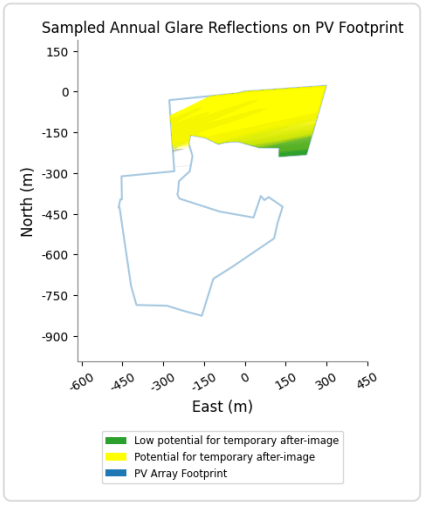
Yellow glare: 1,562 min.

Green glare: 412 min.





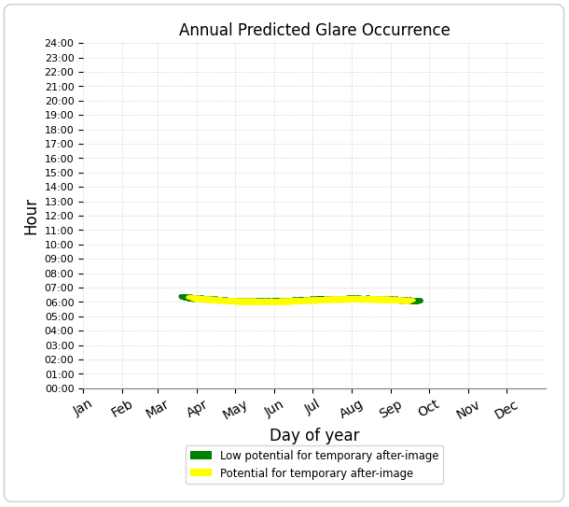


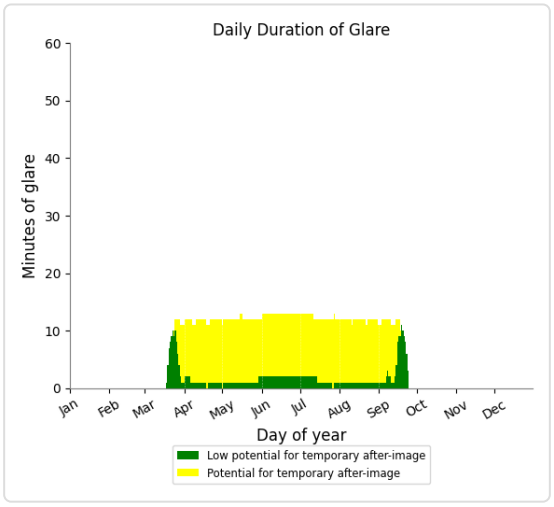


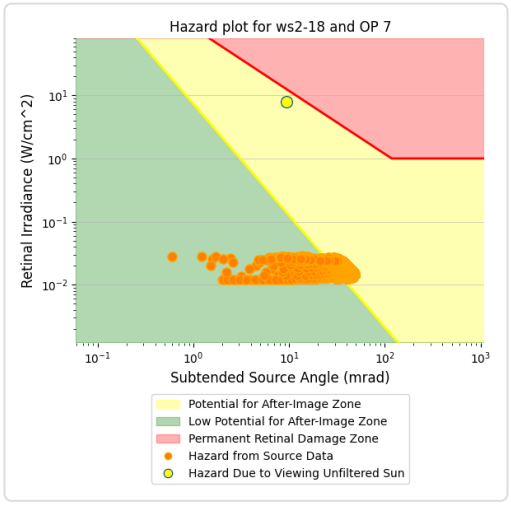
WS2 - 18 and OP 7

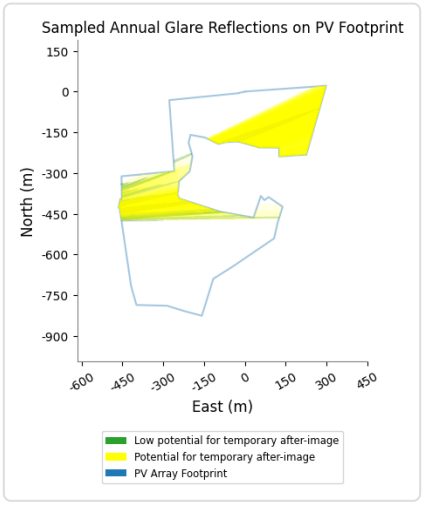
Yellow glare: 1,875 min.

Green glare: 377 min.





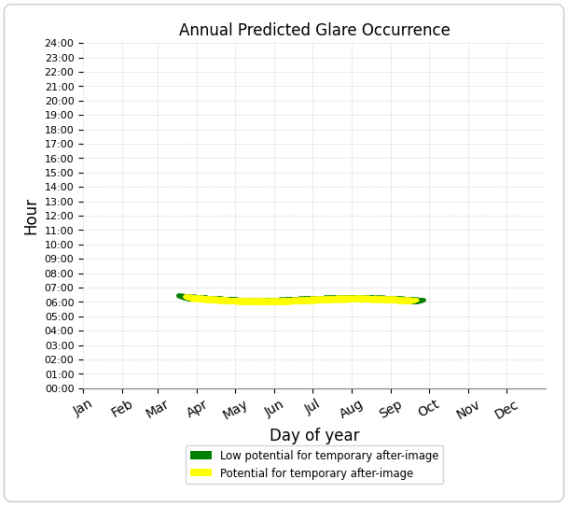


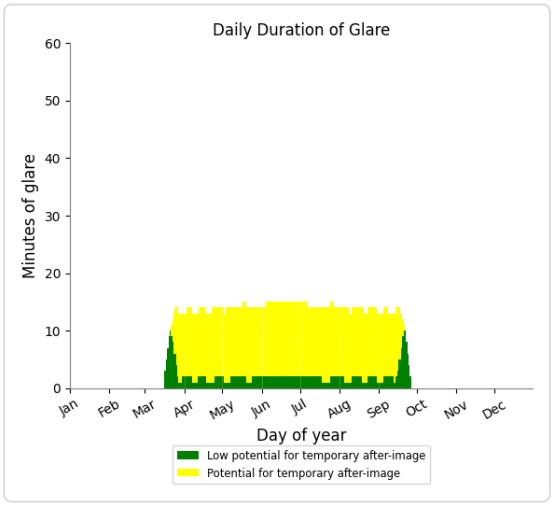


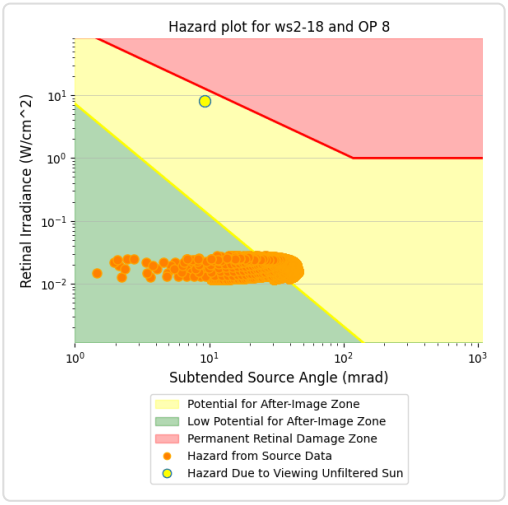
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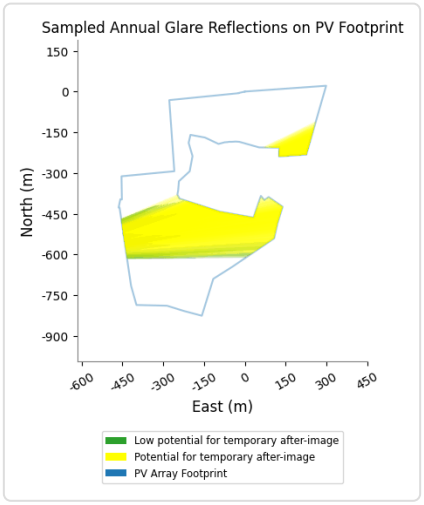
Yellow glare: 2,199 min.

Green glare: 435 min.





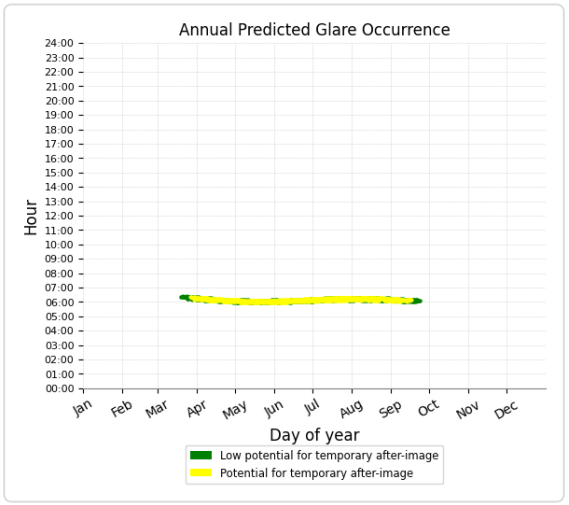


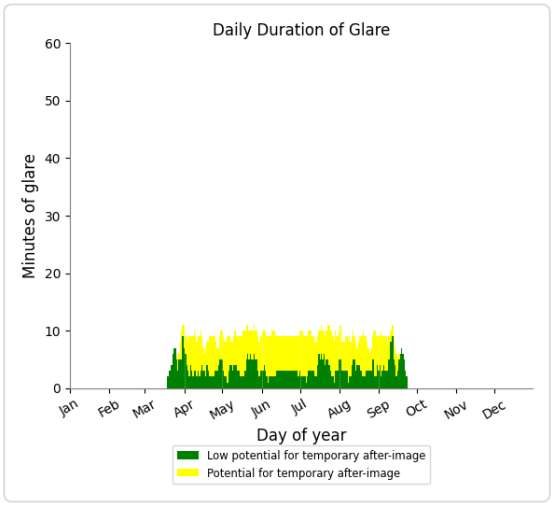


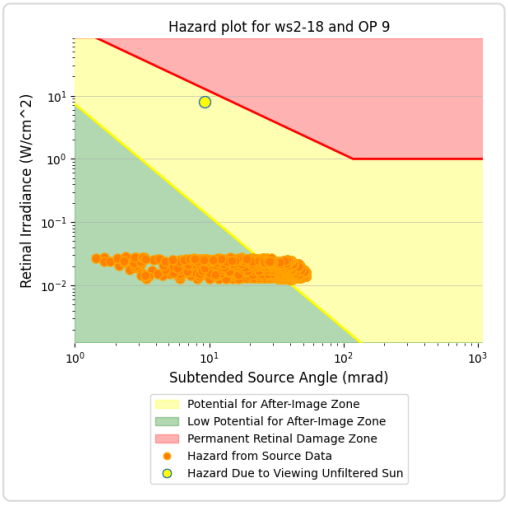
WS2 - 18 and OP 9

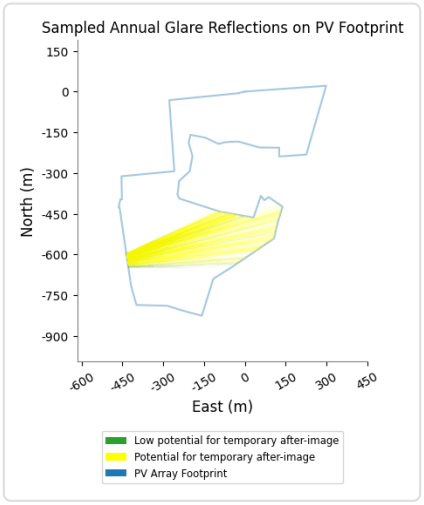
Yellow glare: 985 min.

Green glare: 658 min.





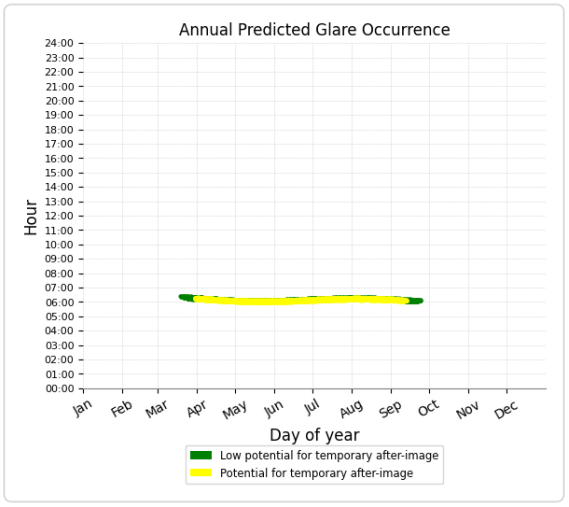


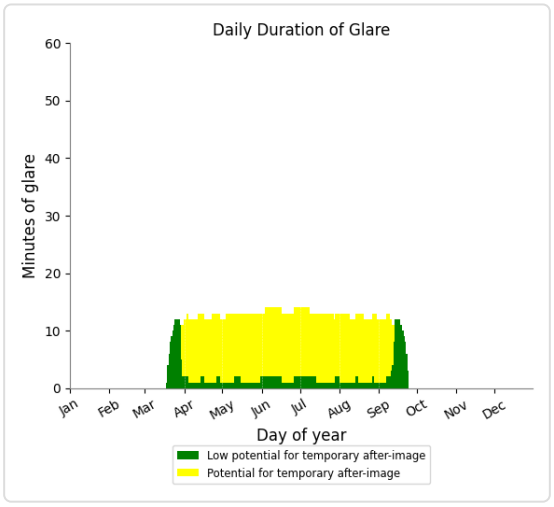


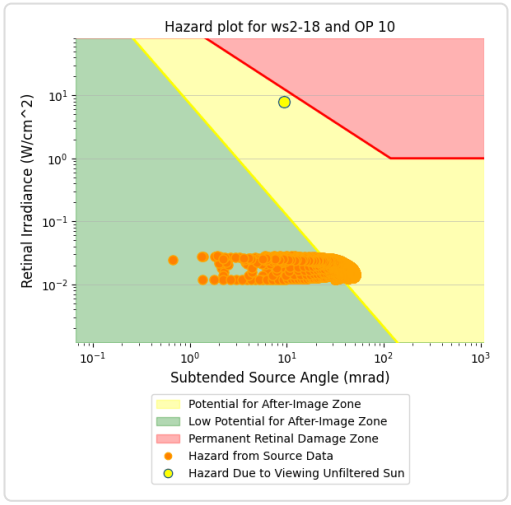
WS2 - 18 and OP 10

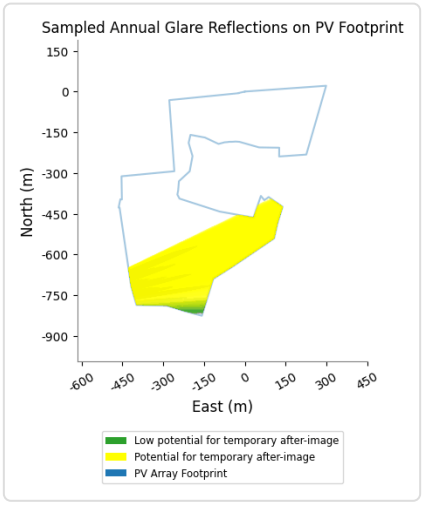
Yellow glare: 1,916 min.

Green glare: 460 min.





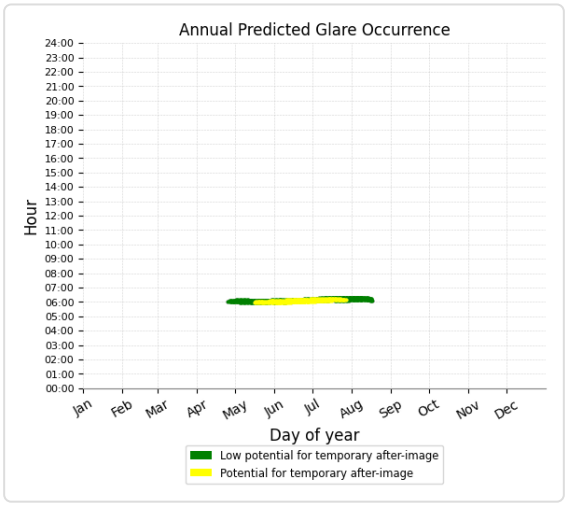


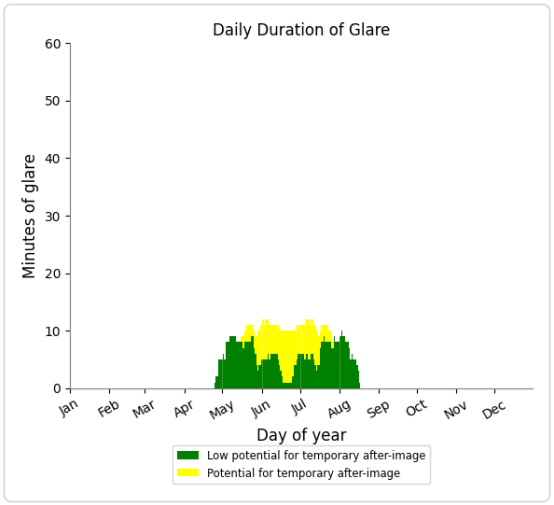


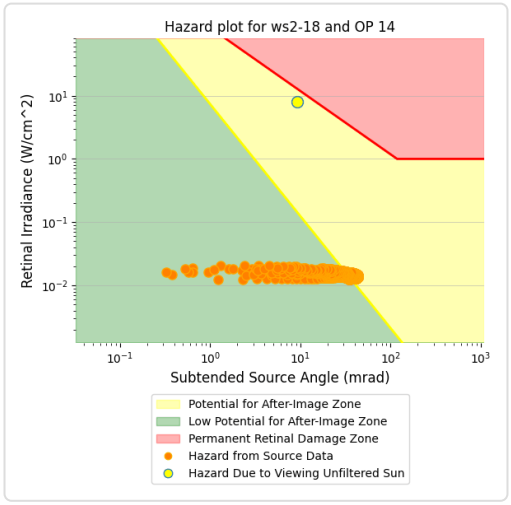
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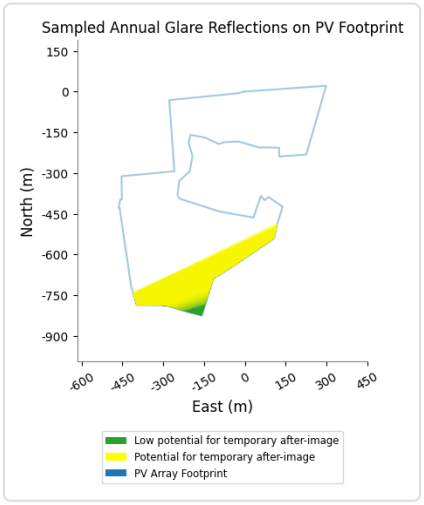
Yellow glare: 378 min.

Green glare: 673 min.





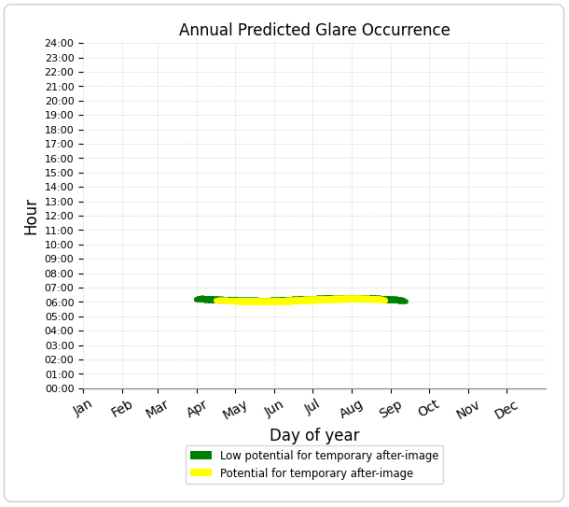


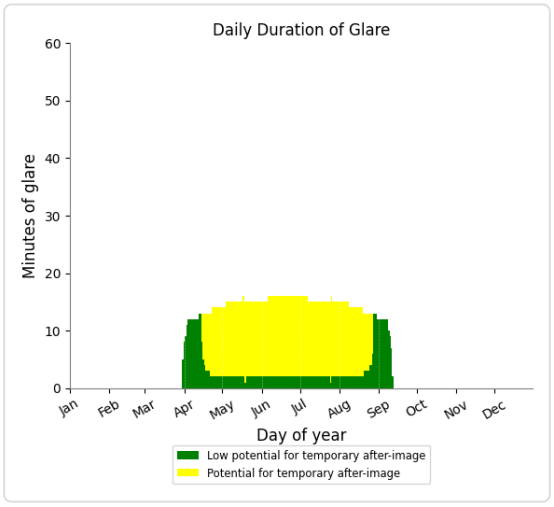


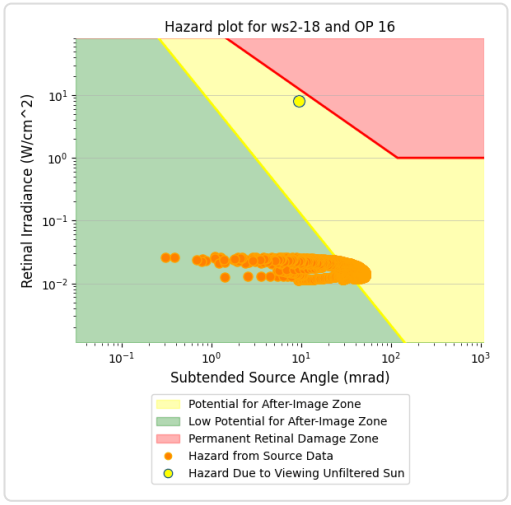
WS2 - 18 and OP 16

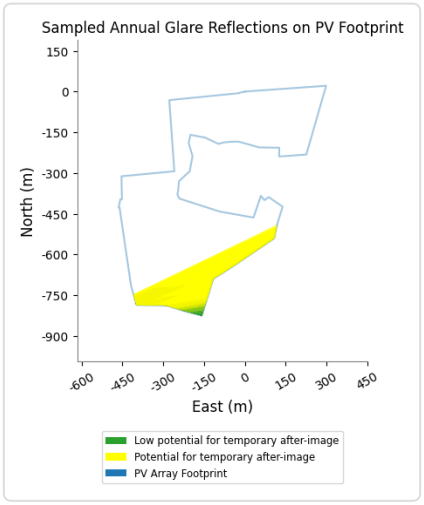
Yellow glare: 1,711 min.

Green glare: 637 min.





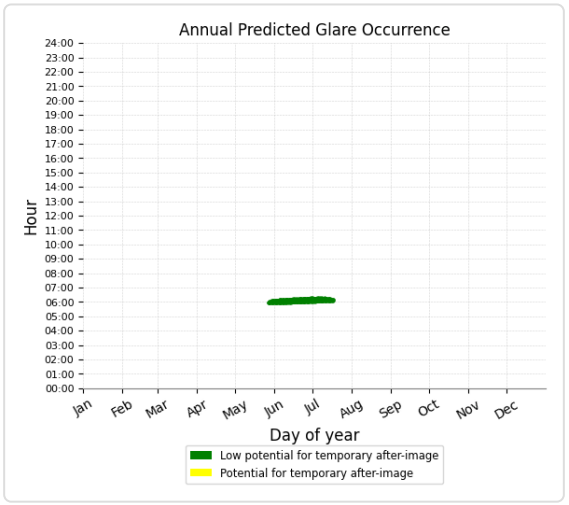


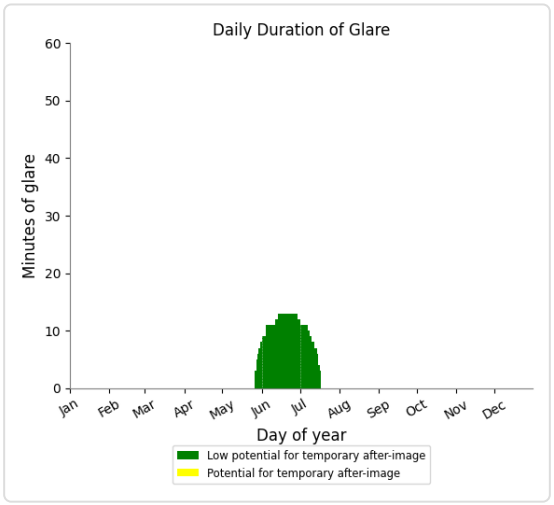


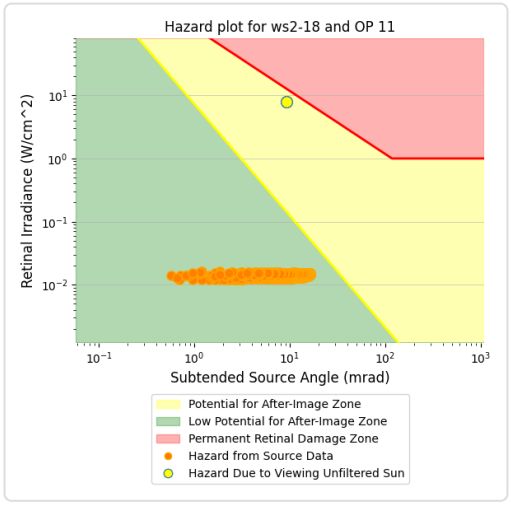
WS2 - 18 and OP 11

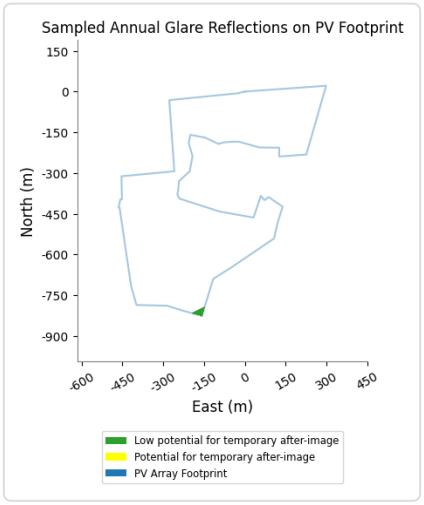
Yellow glare: none

Green glare: 534 min.





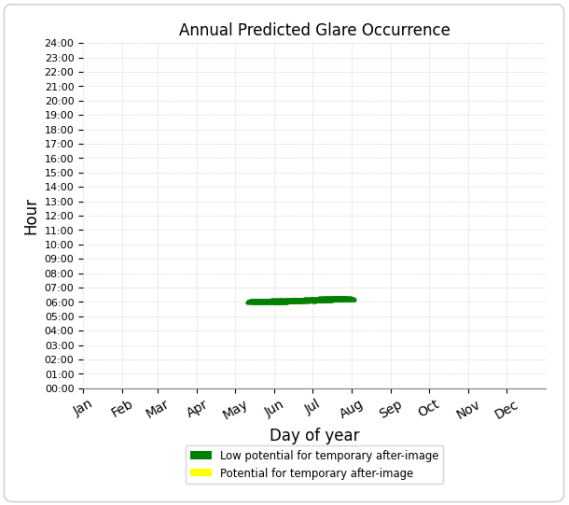


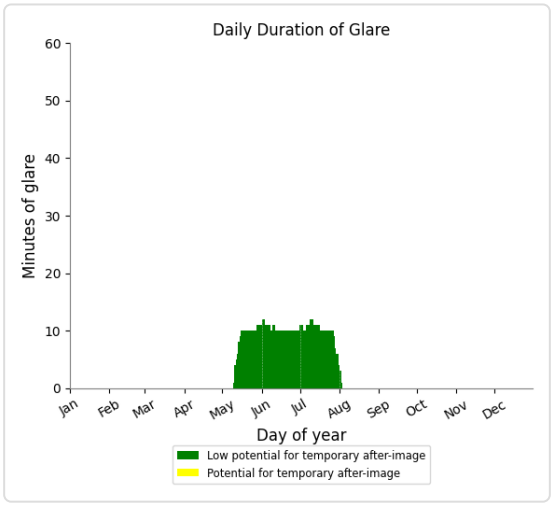


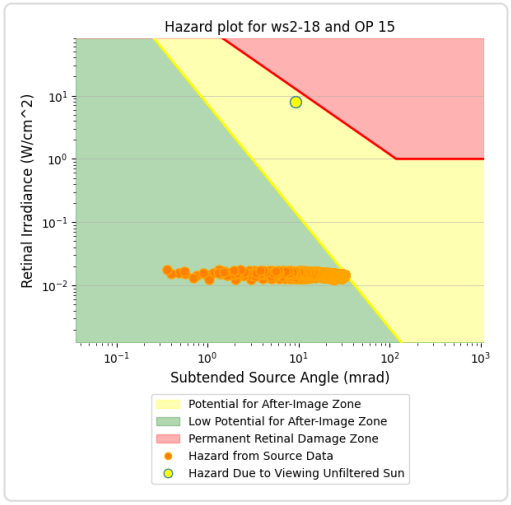
WS2 - 18 and OP 15

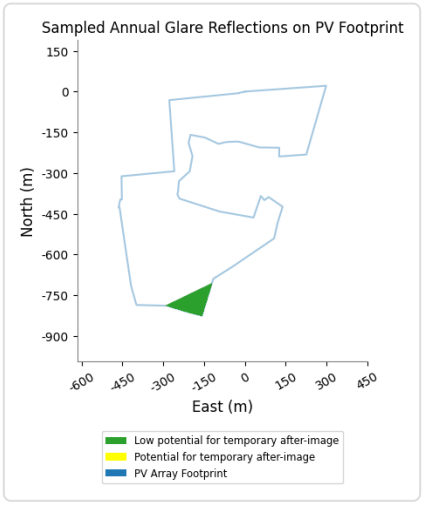
Yellow glare: none

Green glare: 831 min.









WS2 - 18 and OP 12

No glare found

WS2 - 18 and OP 13

No glare found

WS2 - 18 and OP 17

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone**
Site configuration: **W2A-temp-14**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 153733.25317

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
W2A	8.0	180.0	110,551	1,842.5	118,184	1,969.7	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1A	1,237	20.6	5,295	88.2
Route 2A	107,868	1,797.8	110,946	1,849.1
Route 3A	0	0.0	0	0.0
Route 4A	775	12.9	418	7.0
Route 5A	671	11.2	1,525	25.4

Component Data

PV Arrays

Name: W2A
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414444	-1.260646	123.52	3.80	127.32
2	53.414636	-1.256162	117.83	3.80	121.63
3	53.412360	-1.257256	110.33	3.80	114.13
4	53.412296	-1.258758	110.10	3.80	113.90
5	53.412587	-1.258753	112.20	3.80	116.00
6	53.412596	-1.259868	113.86	3.80	117.66
7	53.412782	-1.260957	113.23	3.80	117.03
8	53.412790	-1.261171	112.46	3.80	116.26
9	53.412785	-1.261278	112.06	3.80	115.86
10	53.412784	-1.261332	111.97	3.80	115.77
11	53.412783	-1.261390	111.91	3.80	115.71
12	53.412782	-1.261455	111.85	3.80	115.65
13	53.412782	-1.261521	111.72	3.80	115.52
14	53.412772	-1.261623	111.55	3.80	115.35
15	53.412766	-1.261767	111.46	3.80	115.26
16	53.412711	-1.262105	110.60	3.80	114.40
17	53.412922	-1.262854	111.30	3.80	115.10
18	53.413012	-1.263656	111.78	3.80	115.58
19	53.412747	-1.263758	110.51	3.80	114.31
20	53.412309	-1.263543	109.12	3.80	112.92
21	53.411807	-1.263699	107.72	3.80	111.52
22	53.411477	-1.264294	108.85	3.80	112.65
23	53.411170	-1.264337	108.05	3.80	111.85
24	53.411036	-1.264380	107.58	3.80	111.38
25	53.410902	-1.264262	107.51	3.80	111.31
26	53.410473	-1.262041	110.88	3.80	114.68
27	53.410275	-1.260174	109.43	3.80	113.23
28	53.410991	-1.259766	108.44	3.80	112.24
29	53.410850	-1.259573	106.77	3.80	110.57
30	53.410953	-1.259337	105.84	3.80	109.64
31	53.410633	-1.258565	107.82	3.80	111.62
32	53.410096	-1.258844	107.60	3.80	111.40
33	53.409584	-1.259037	110.45	3.80	114.25
34	53.408650	-1.261333	119.76	3.80	123.56
35	53.408248	-1.262395	121.79	3.80	125.59
36	53.407211	-1.262996	126.54	3.80	130.34
37	53.407223	-1.264780	127.83	0.00	127.83
38	53.407401	-1.266597	127.77	3.80	131.57
39	53.408021	-1.266940	123.07	3.80	126.87
40	53.410605	-1.267573	111.19	3.80	114.99
41	53.410605	-1.267627	111.28	3.80	115.08
42	53.410880	-1.267530	110.72	3.80	114.52
43	53.410874	-1.267455	110.48	3.80	114.28
44	53.410874	-1.267445	110.44	3.80	114.24
45	53.411641	-1.267466	112.65	3.80	116.45
46	53.411897	-1.264827	112.09	3.80	115.89
47	53.413982	-1.265513	118.13	3.80	121.93
48	53.414391	-1.260986	122.68	3.80	126.48
49	53.414397	-1.260986	122.73	3.80	126.53
50	53.414442	-1.260653	123.52	3.80	127.32

Route Receptors

Name: Route 1A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.405555	-1.252104	126.65	0.00	126.65
2	53.405651	-1.255119	129.62	0.00	129.62
3	53.405977	-1.258048	124.37	0.00	124.37
4	53.406099	-1.258606	123.04	0.00	123.04
5	53.406604	-1.259153	120.89	0.00	120.89
6	53.407023	-1.260725	121.57	0.00	121.57
7	53.407742	-1.260156	118.83	0.00	118.83
8	53.408941	-1.260639	116.55	0.00	116.55
9	53.410684	-1.259958	109.57	0.00	109.57
10	53.411186	-1.259684	108.07	0.00	108.07
11	53.411966	-1.259877	109.65	0.00	109.65
12	53.412171	-1.260317	110.78	0.00	110.78
13	53.412449	-1.260510	112.64	0.00	112.64
14	53.412705	-1.260580	113.97	0.00	113.97
15	53.412772	-1.260591	114.21	0.00	114.21

Name: Route 2A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.408044	-1.260292	117.44	0.00	117.44
2	53.407700	-1.262628	124.19	0.00	124.19
3	53.408427	-1.264779	123.48	0.00	123.48
4	53.410141	-1.265680	109.64	0.00	109.64
5	53.410742	-1.266024	108.69	0.00	108.69

Name: Route 3A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.415039	-1.272000	140.08	0.00	140.08
2	53.413275	-1.271656	124.92	0.00	124.92
3	53.411944	-1.271742	118.13	0.00	118.13

Name: Route 4A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.410243	-1.283544	114.75	0.00	114.75
2	53.411215	-1.281226	121.54	0.00	121.54
3	53.412034	-1.278394	125.16	0.00	125.16
4	53.412635	-1.276356	124.32	0.00	124.32

Name: Route 5A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.410476	-1.243383	98.44	0.00	98.44
2	53.410578	-1.245561	99.43	0.00	99.43
3	53.409613	-1.250035	104.87	0.00	104.87
4	53.407470	-1.250228	113.99	0.00	113.99
5	53.405782	-1.251323	125.93	0.00	125.93
6	53.404266	-1.252921	127.82	0.00	127.82
7	53.402699	-1.254413	126.73	0.00	126.73
8	53.401004	-1.255346	124.38	0.00	124.38
9	53.400025	-1.256666	117.73	0.00	117.73
10	53.400134	-1.254552	116.91	0.00	116.91
11	53.400153	-1.254155	116.65	0.00	116.65

Glare Analysis Results

Summary of Results Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
W2A	8.0	180.0	110,551	1,842.5	118,184	1,969.7	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1A	1,237	20.6	5,295	88.2
Route 2A	107,868	1,797.8	110,946	1,849.1
Route 3A	0	0.0	0	0.0
Route 4A	775	12.9	418	7.0
Route 5A	671	11.2	1,525	25.4

PV: W2A potential temporary after-image

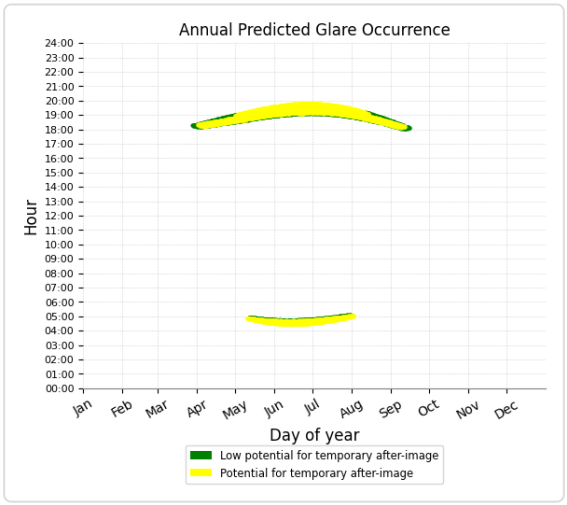
Receptor results ordered by category of glare

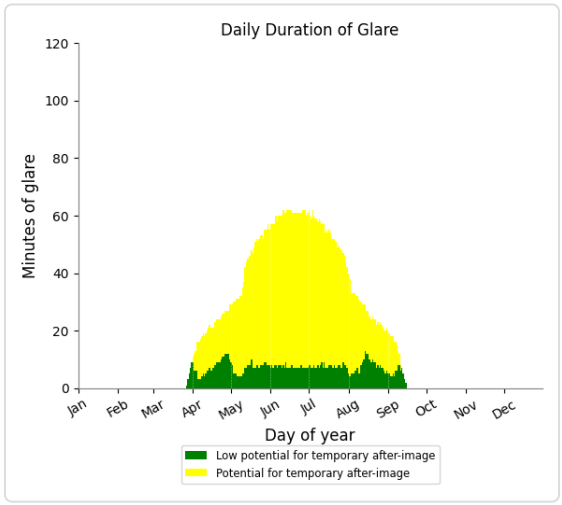
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1A	1,237	20.6	5,295	88.2
Route 2A	107,868	1,797.8	110,946	1,849.1
Route 4A	775	12.9	418	7.0
Route 5A	671	11.2	1,525	25.4
Route 3A	0	0.0	0	0.0

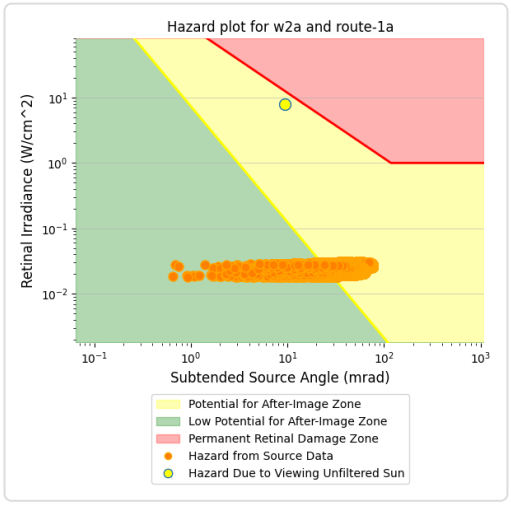
W2A and Route: Route 1A

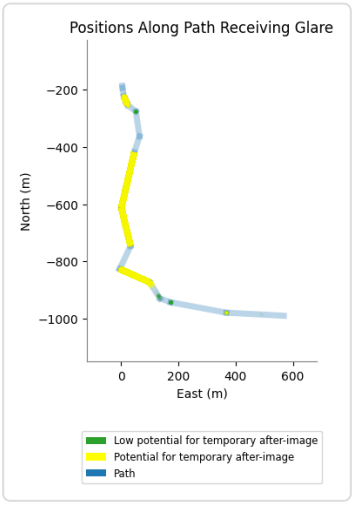
Yellow glare: 5,295 min.

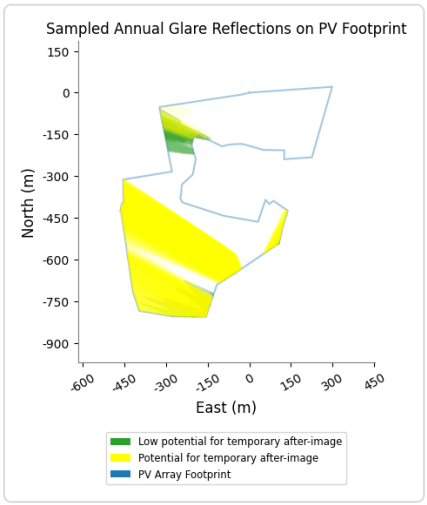
Green glare: 1,237 min.







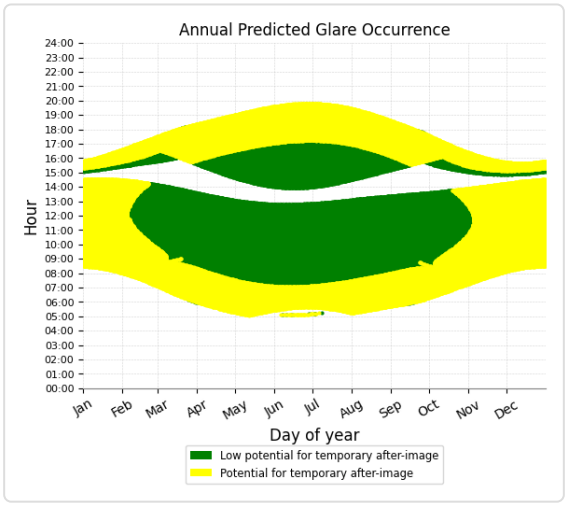


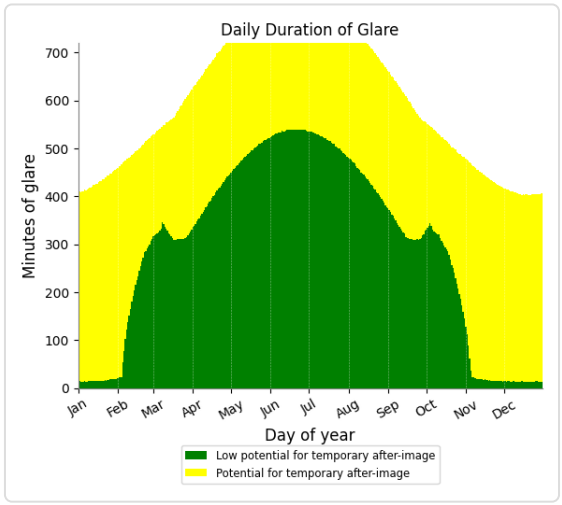


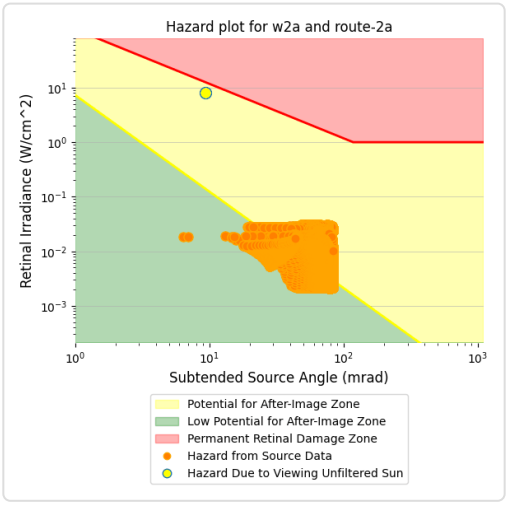
W2A and Route: Route 2A

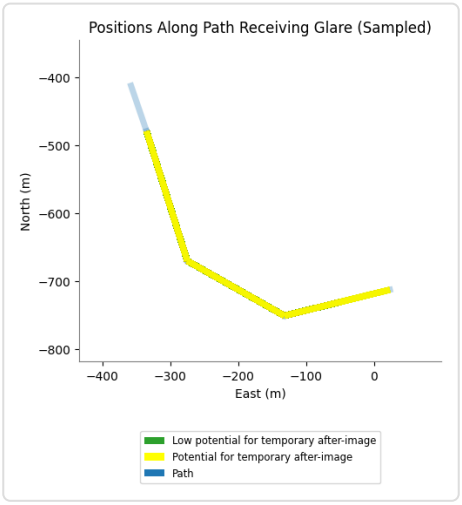
Yellow glare: 110,946 min.

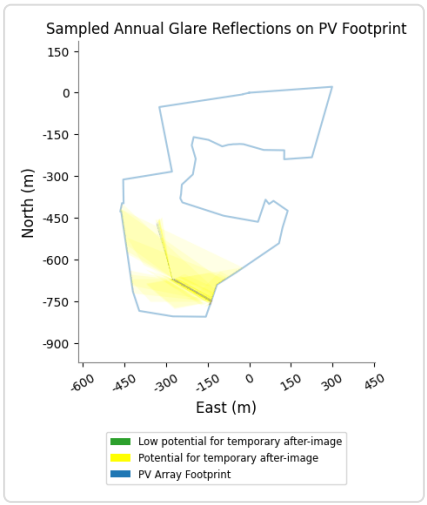
Green glare: 107,868 min.







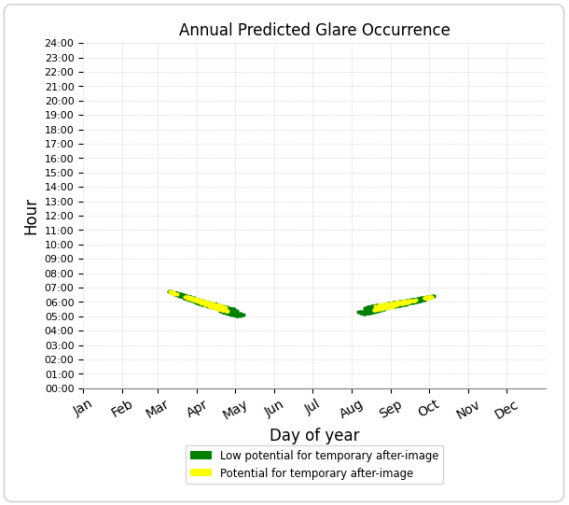


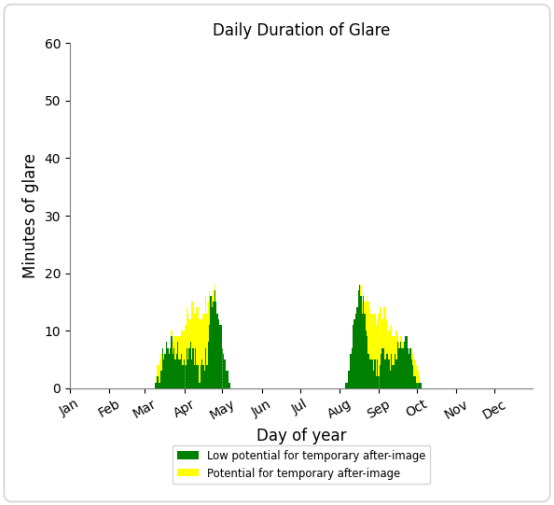


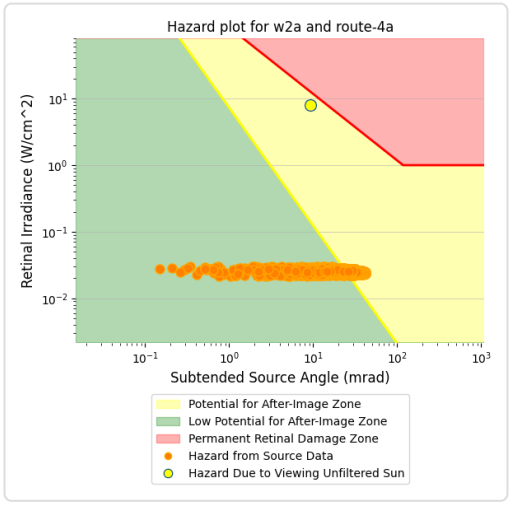
W2A and Route: Route 4A

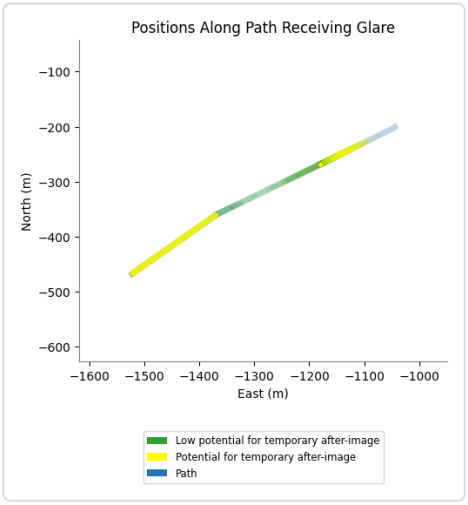
Yellow glare: 418 min.

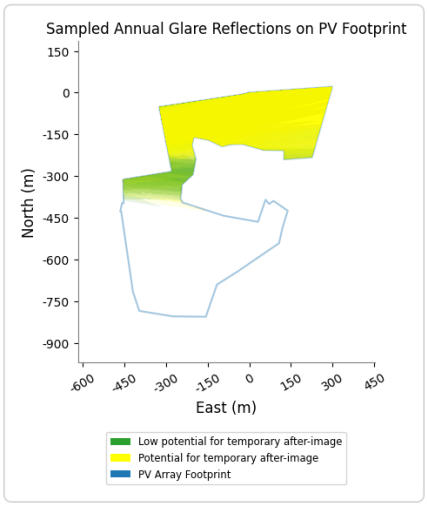
Green glare: 775 min.







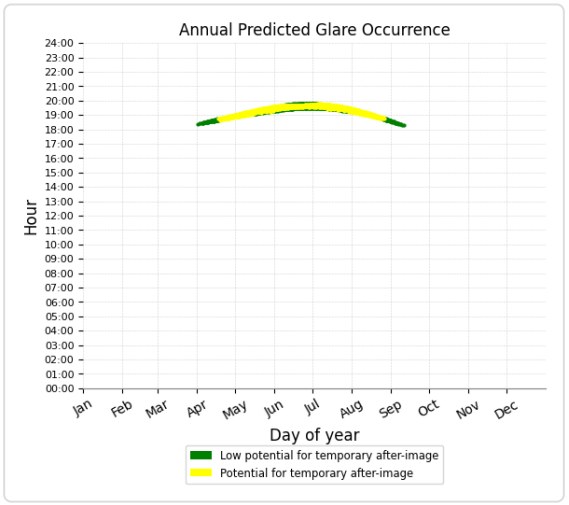


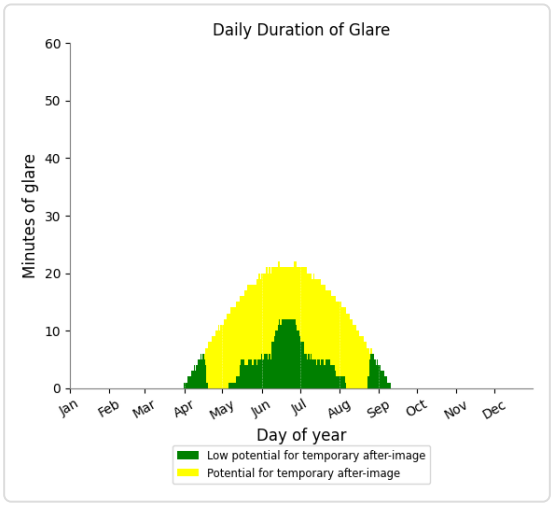


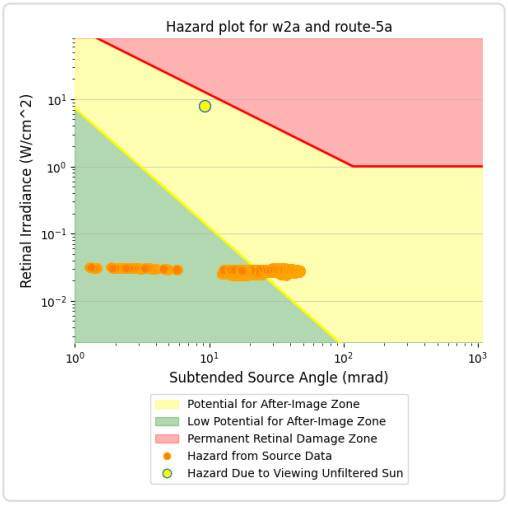
W2A and Route: Route 5A

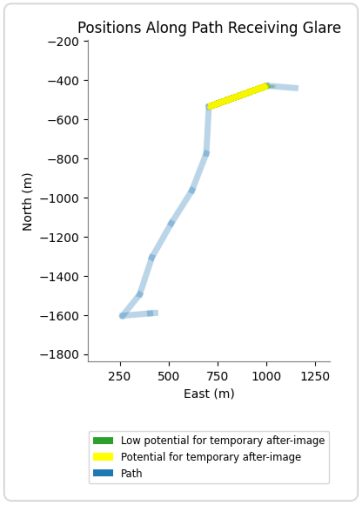
Yellow glare: 1,525 min.

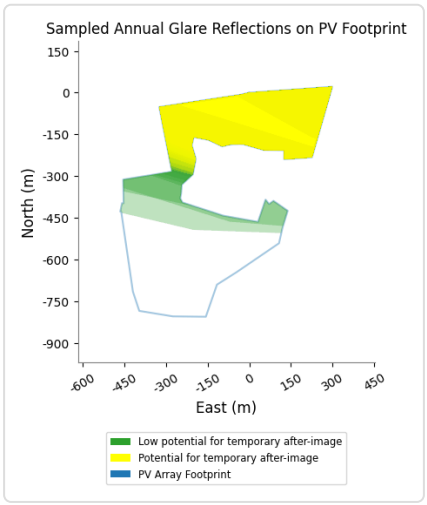
Green glare: 671 min.











W2A and Route: Route 3A

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone**
Site configuration: **W2A-temp-13**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 153700.25317

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
W2A	25.0	180.0	136,802	2,280.0	68,823	1,147.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1A	1,325	22.1	6,481	108.0
Route 2A	134,163	2,236.1	58,994	983.2
Route 3A	0	0.0	0	0.0
Route 4A	1,144	19.1	793	13.2
Route 5A	170	2.8	2,555	42.6

Component Data

PV Arrays

Name: W2A
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414444	-1.260646	123.52	3.80	127.32
2	53.414636	-1.256162	117.83	3.80	121.63
3	53.412360	-1.257256	110.33	3.80	114.13
4	53.412296	-1.258758	110.10	3.80	113.90
5	53.412587	-1.258753	112.20	3.80	116.00
6	53.412596	-1.259868	113.86	3.80	117.66
7	53.412782	-1.260957	113.23	3.80	117.03
8	53.412790	-1.261171	112.46	3.80	116.26
9	53.412785	-1.261278	112.06	3.80	115.86
10	53.412784	-1.261332	111.97	3.80	115.77
11	53.412783	-1.261390	111.91	3.80	115.71
12	53.412782	-1.261455	111.85	3.80	115.65
13	53.412782	-1.261521	111.72	3.80	115.52
14	53.412772	-1.261623	111.55	3.80	115.35
15	53.412766	-1.261767	111.46	3.80	115.26
16	53.412711	-1.262105	110.60	3.80	114.40
17	53.412922	-1.262854	111.30	3.80	115.10
18	53.413012	-1.263656	111.78	3.80	115.58
19	53.412747	-1.263758	110.51	3.80	114.31
20	53.412309	-1.263543	109.12	3.80	112.92
21	53.411807	-1.263699	107.72	3.80	111.52
22	53.411477	-1.264294	108.85	3.80	112.65
23	53.411170	-1.264337	108.05	3.80	111.85
24	53.411036	-1.264380	107.58	3.80	111.38
25	53.410902	-1.264262	107.51	3.80	111.31
26	53.410473	-1.262041	110.88	3.80	114.68
27	53.410275	-1.260174	109.43	3.80	113.23
28	53.410991	-1.259766	108.44	3.80	112.24
29	53.410850	-1.259573	106.77	3.80	110.57
30	53.410953	-1.259337	105.84	3.80	109.64
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32	53.410096	-1.258844	107.60	3.80	111.40
33	53.409584	-1.259037	110.45	3.80	114.25
34	53.408650	-1.261333	119.76	3.80	123.56
35	53.408248	-1.262395	121.79	3.80	125.59
36	53.407211	-1.262996	126.54	3.80	130.34
37	53.407223	-1.264780	127.83	0.00	127.83
38	53.407401	-1.266597	127.77	3.80	131.57
39	53.408021	-1.266940	123.07	3.80	126.87
40	53.410605	-1.267573	111.19	3.80	114.99
41	53.410605	-1.267627	111.28	3.80	115.08
42	53.410880	-1.267530	110.72	3.80	114.52
43	53.410874	-1.267455	110.48	3.80	114.28
44	53.410874	-1.267445	110.44	3.80	114.24
45	53.411641	-1.267466	112.65	3.80	116.45
46	53.411897	-1.264827	112.09	3.80	115.89
47	53.413982	-1.265513	118.13	3.80	121.93
48	53.414391	-1.260986	122.68	3.80	126.48
49	53.414397	-1.260986	122.73	3.80	126.53
50	53.414442	-1.260653	123.52	3.80	127.32

Route Receptors

Name: Route 1A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.405555	-1.252104	126.65	0.00	126.65
2	53.405651	-1.255119	129.62	0.00	129.62
3	53.405977	-1.258048	124.37	0.00	124.37
4	53.406099	-1.258606	123.04	0.00	123.04
5	53.406604	-1.259153	120.89	0.00	120.89
6	53.407023	-1.260725	121.57	0.00	121.57
7	53.407742	-1.260156	118.83	0.00	118.83
8	53.408941	-1.260639	116.55	0.00	116.55
9	53.410684	-1.259958	109.57	0.00	109.57
10	53.411186	-1.259684	108.07	0.00	108.07
11	53.411966	-1.259877	109.65	0.00	109.65
12	53.412171	-1.260317	110.78	0.00	110.78
13	53.412449	-1.260510	112.64	0.00	112.64
14	53.412705	-1.260580	113.97	0.00	113.97
15	53.412772	-1.260591	114.21	0.00	114.21

Name: Route 2A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.408044	-1.260292	117.44	0.00	117.44
2	53.407700	-1.262628	124.19	0.00	124.19
3	53.408427	-1.264779	123.48	0.00	123.48
4	53.410141	-1.265680	109.64	0.00	109.64
5	53.410742	-1.266024	108.69	0.00	108.69

Name: Route 3A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.415039	-1.272000	140.08	0.00	140.08
2	53.413275	-1.271656	124.92	0.00	124.92
3	53.411944	-1.271742	118.13	0.00	118.13

Name: Route 4A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.410243	-1.283544	114.75	0.00	114.75
2	53.411215	-1.281226	121.54	0.00	121.54
3	53.412034	-1.278394	125.16	0.00	125.16
4	53.412635	-1.276356	124.32	0.00	124.32

Name: Route 5A
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.410476	-1.243383	98.44	0.00	98.44
2	53.410578	-1.245561	99.43	0.00	99.43
3	53.409613	-1.250035	104.87	0.00	104.87
4	53.407470	-1.250228	113.99	0.00	113.99
5	53.405782	-1.251323	125.93	0.00	125.93
6	53.404266	-1.252921	127.82	0.00	127.82
7	53.402699	-1.254413	126.73	0.00	126.73
8	53.401004	-1.255346	124.38	0.00	124.38
9	53.400025	-1.256666	117.73	0.00	117.73
10	53.400134	-1.254552	116.91	0.00	116.91
11	53.400153	-1.254155	116.65	0.00	116.65

Glare Analysis Results

Summary of Results Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
W2A	25.0	180.0	136,802	2,280.0	68,823	1,147.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1A	1,325	22.1	6,481	108.0
Route 2A	134,163	2,236.1	58,994	983.2
Route 3A	0	0.0	0	0.0
Route 4A	1,144	19.1	793	13.2
Route 5A	170	2.8	2,555	42.6

PV: W2A potential temporary after-image

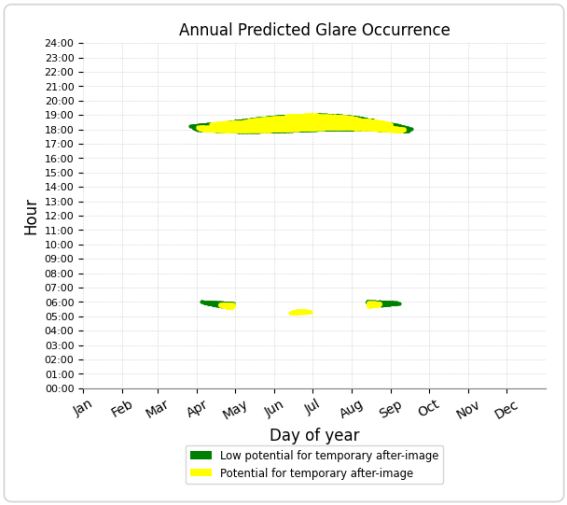
Receptor results ordered by category of glare

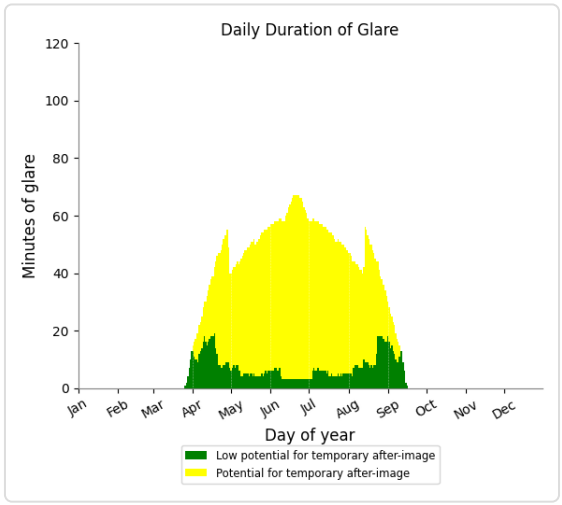
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1A	1,325	22.1	6,481	108.0
Route 2A	134,163	2,236.1	58,994	983.2
Route 4A	1,144	19.1	793	13.2
Route 5A	170	2.8	2,555	42.6
Route 3A	0	0.0	0	0.0

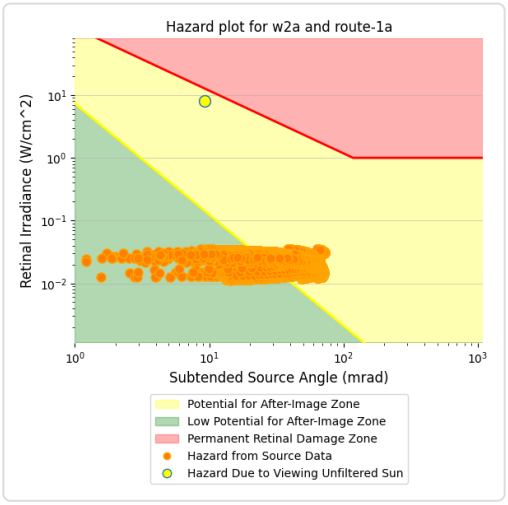
W2A and Route: Route 1A

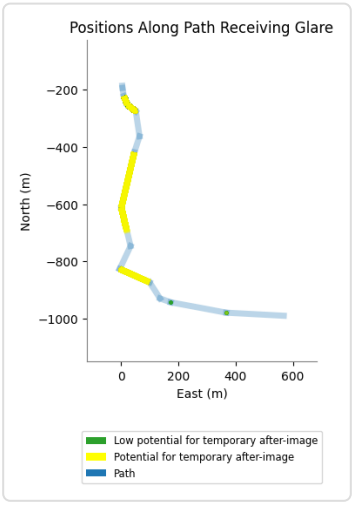
Yellow glare: 6,481 min.

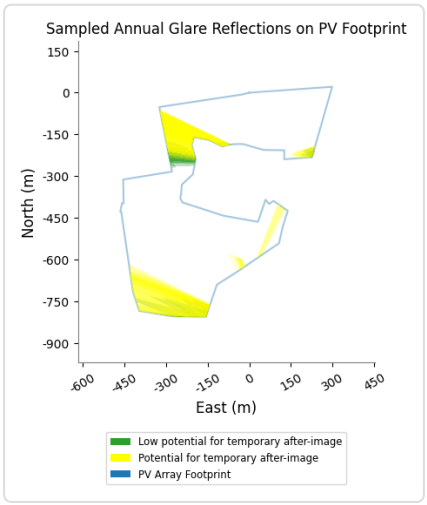
Green glare: 1,325 min.







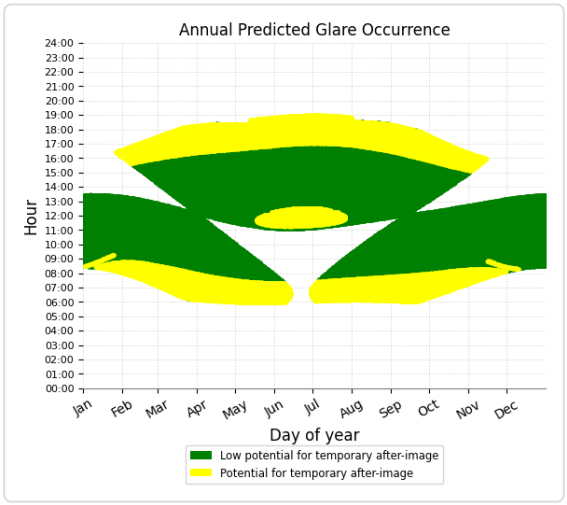


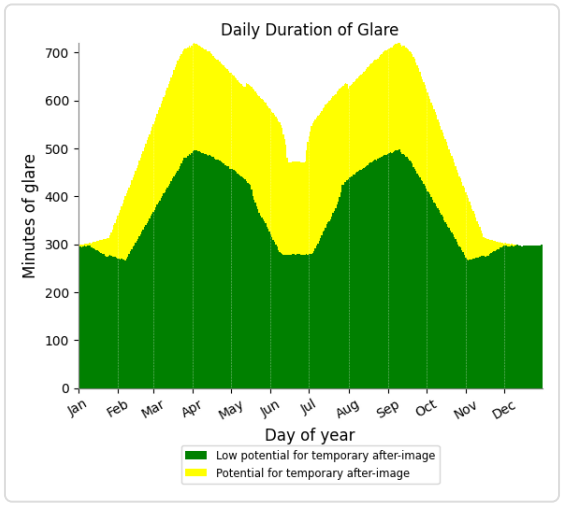


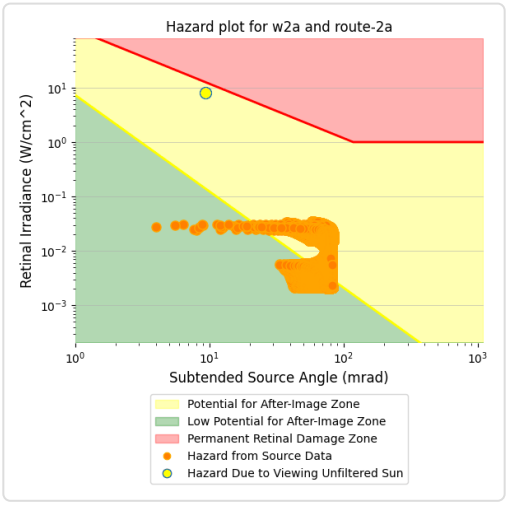
W2A and Route: Route 2A

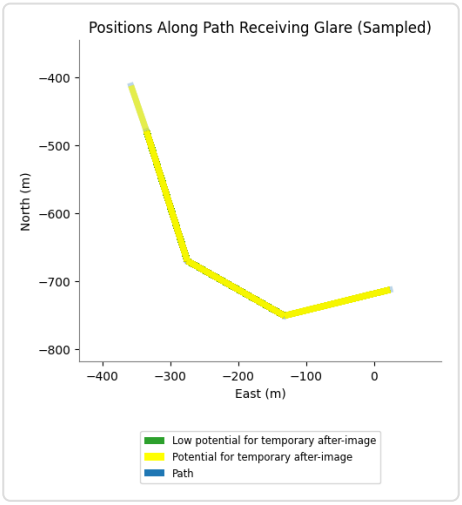
Yellow glare: 58,994 min.

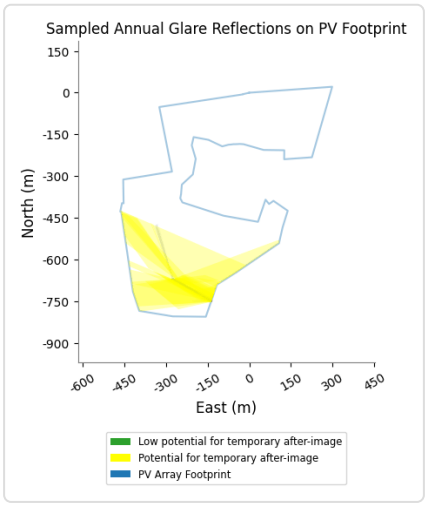
Green glare: 134,163 min.







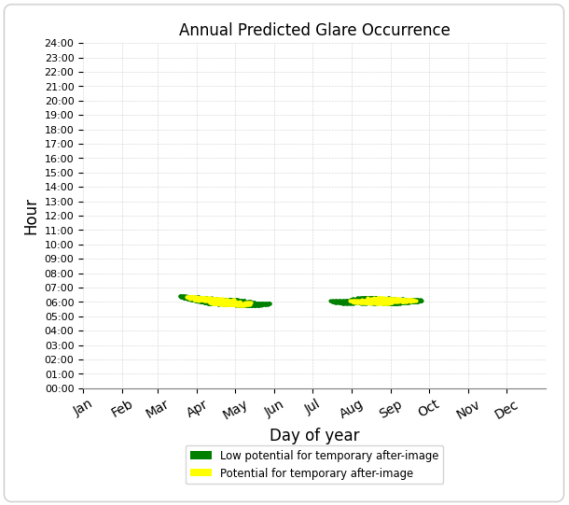


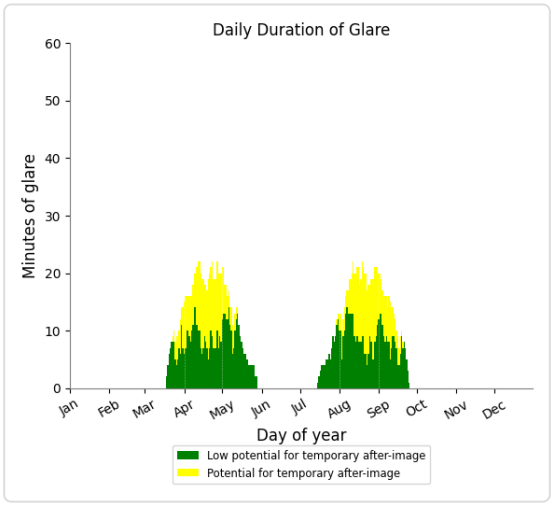


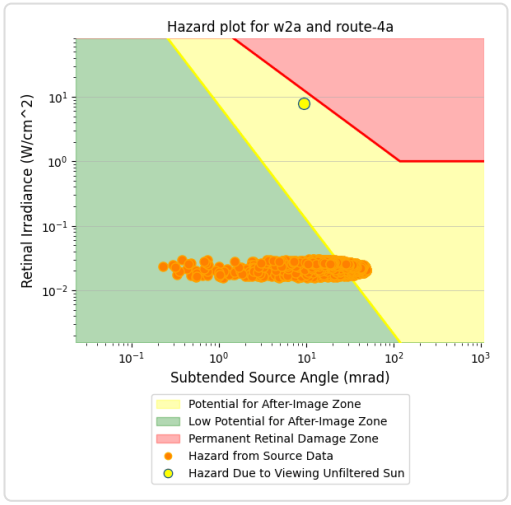
W2A and Route: Route 4A

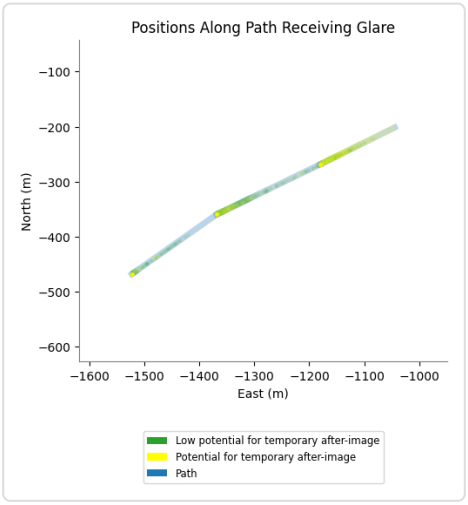
Yellow glare: 793 min.

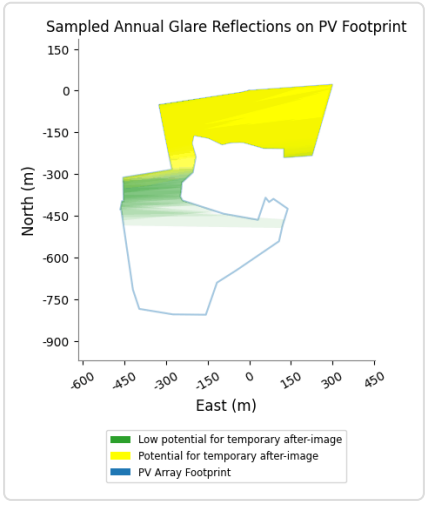
Green glare: 1,144 min.







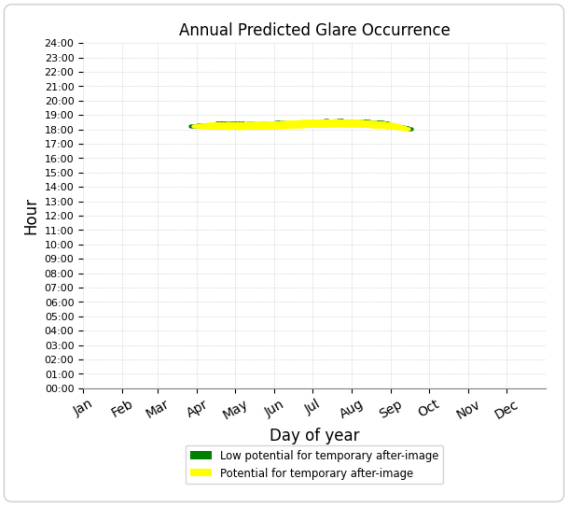


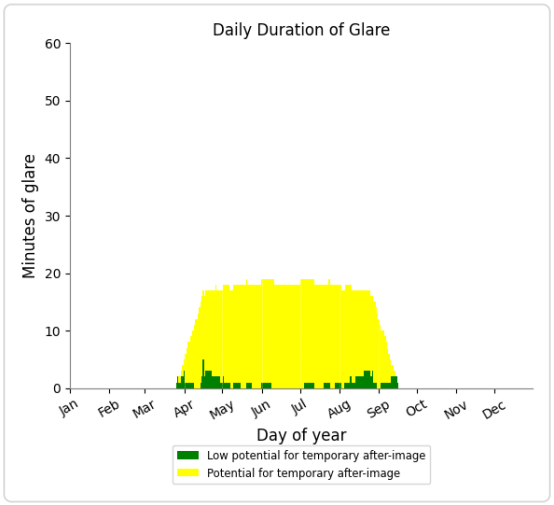


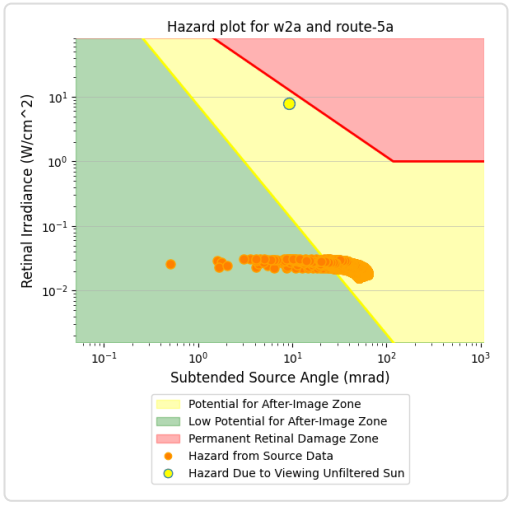
W2A and Route: Route 5A

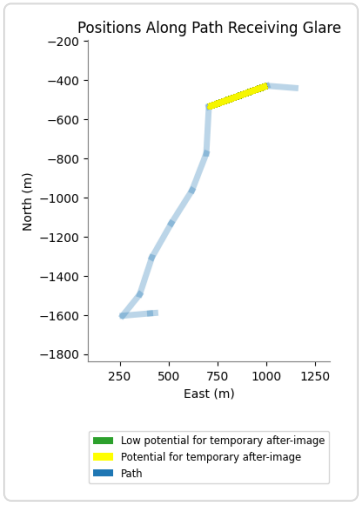
Yellow glare: 2,555 min.

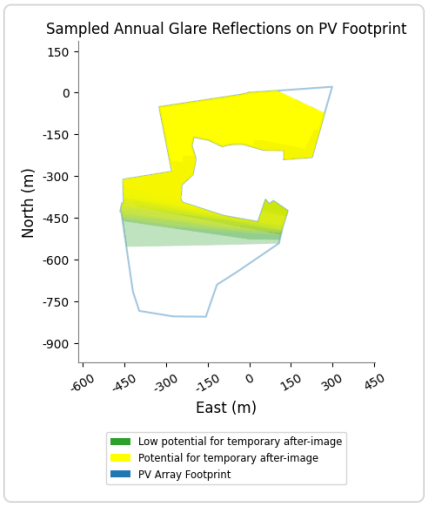
Green glare: 170 min.











W2A and Route: Route 3A

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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W2B

W2 Area	OP No. in Glare Analysis	Residential Receptor No.
A	1	1
A	2	2
A	3	3
A	4	4
A	5	5
A	6	6
A	7	7
A	8	8
A	9	9
A	10	10
A	11	11
A	12	12
A	13	13
A	14	14
A	15	15
A	16	16
A	17	17
B	1	18
B	2	19
B	3	20
B	4	21
B	5	22
B	6	23
B	7	24
B	8	25
B	9	26
B	10	27
B	11	28
B	12	29
B	13	30
B	14	31
B	15	32
B	16	33
C	1	34
C	2	35

C	3	36
C	4	37
C	5	38
C	6	39
C	7	40
C	8	41
C	9	42
C	10	43
C	11	44
C	12	45
C	13	46
C	14	47
C	15	48
C	16	49
C	17	50
C	18	51
C	19	52
C	20	53
C	21	22
C	22	54
C	23	55
C	24	56
C	25	57
C	26	58
C	27	59
C	28	60
C	29	61
C	30	62
C	31	21
C	32	20
C	33	19
C	34	63
C	35	18
C	36	64
C	37	65
D	1	66
D	2	67
D	3	68
D	4	69
D	5	70
D	6	71

D	7	72
D	8	73
D	9	74
D	10	75
D	11	76
D	12	77
D	13	78
D	14	79
D	15	80
D	16	81
D	17	82
D	18	83
D	19	84
D	20	43
D	21	42
D	22	85
D	23	41
D	24	40
D	25	86
D	26	37
D	27	39
D	28	38
D	29	36
D	30	35
E	1	87
E	2	88
E	3	89
E	4	90
E	5	91
E	6	92
E	7	93
E	8	94
E	9	95
E	10	96
E	11	97
E	12	98
E	13	99
E	14	100
E	15	101
E	16	102
E	17	103

E	18	104
E	19	105
E	20	106
E	21	107
E	22	82
E	23	81
E	24	79
E	25	78
E	26	80
E	27	77
E	28	76
E	29	75

FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **JS W2B - All**

Created 03 Jul, 2025
Updated 03 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153833.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 14	8.0	180.0	138,555	2,309.2	87,513	1,458.5	-
WS2 - 15	8.0	180.0	128,435	2,140.6	136,136	2,268.9	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1B	709	11.8	121	2.0
PRoW 2B	219,951	3,665.8	157,469	2,624.5
PRoW 5B	1,881	31.4	942	15.7
Route 1B - Part 1	3,277	54.6	5,004	83.4
Route 1B - Part 2	2,156	35.9	4,446	74.1
Route 2B	818	13.6	4,543	75.7
Route 3B	3,378	56.3	8,483	141.4
Route 4B	250	4.2	51	0.8
OP 1	1,214	20.2	15	0.2
OP 2	2,422	40.4	1,090	18.2
OP 3	2,755	45.9	5,802	96.7
OP 4	3,980	66.3	3,667	61.1
OP 5	1,074	17.9	0	0.0
OP 6	39	0.7	0	0.0
OP 7	1,239	20.6	4,130	68.8

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 8	1,727	28.8	3,437	57.3
OP 9	2,164	36.1	2,355	39.2
OP 10	4,428	73.8	3,010	50.2
OP 11	4,168	69.5	2,656	44.3
OP 12	2,824	47.1	4,621	77.0
OP 13	1,616	26.9	3,532	58.9
OP 14	1,376	22.9	3,735	62.2
OP 15	516	8.6	3,543	59.0
OP 16	3,028	50.5	997	16.6

Component Data

PV Arrays

Name: WS2 - 14
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.390820	-1.343497	72.03	3.80	75.83
2	53.391511	-1.340729	80.71	3.80	84.51
3	53.388529	-1.338240	90.26	3.80	94.06
4	53.388644	-1.337554	86.16	3.80	89.96
5	53.387524	-1.334785	81.36	3.80	85.16
6	53.386321	-1.336245	96.26	3.80	100.06
7	53.387268	-1.339871	92.17	3.80	95.97
8	53.387524	-1.340922	92.15	3.80	95.95
9	53.388535	-1.341802	93.88	3.80	97.68
10	53.389174	-1.342854	84.88	3.80	88.68

Name: WS2 - 15
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.392241	-1.338284	50.76	3.80	54.56
2	53.392609	-1.339175	54.21	3.80	58.01
3	53.393341	-1.339926	54.17	3.80	57.97
4	53.393888	-1.340559	51.07	3.80	54.87
5	53.394202	-1.340891	50.10	3.80	53.90
6	53.394720	-1.341047	44.90	3.80	48.70
7	53.394694	-1.340215	42.70	3.80	46.50
8	53.394733	-1.339486	40.64	3.80	44.44
9	53.394873	-1.339035	39.44	3.80	43.24
10	53.395021	-1.338466	37.45	3.80	41.25
11	53.395097	-1.337812	35.75	3.80	39.55
12	53.395257	-1.337318	34.85	3.80	38.65
13	53.395577	-1.336535	29.09	3.80	32.89
14	53.395460	-1.336123	27.80	3.80	31.60
15	53.391843	-1.331799	28.52	3.80	32.32
16	53.392291	-1.330468	30.98	3.80	34.78
17	53.391702	-1.330146	30.09	3.80	33.89
18	53.391306	-1.329760	31.71	3.80	35.51
19	53.391062	-1.329567	31.47	3.80	35.27
20	53.390615	-1.329546	30.75	3.80	34.55
21	53.390039	-1.329653	31.55	3.80	35.35
22	53.389629	-1.329910	33.32	3.80	37.12
23	53.389181	-1.329331	32.81	3.80	36.61
24	53.388478	-1.327486	32.96	3.80	36.76
25	53.388106	-1.326220	34.40	3.80	38.20
26	53.386801	-1.325984	33.46	3.80	37.26
27	53.386225	-1.325254	33.29	3.80	37.09
28	53.386366	-1.324321	34.02	3.80	37.82
29	53.385931	-1.323709	36.02	3.80	39.82
30	53.385442	-1.324242	39.14	3.80	42.94
31	53.384930	-1.324671	42.51	3.80	46.31
32	53.384470	-1.324886	44.31	3.80	48.11
33	53.384201	-1.324822	45.22	3.80	49.02
34	53.383830	-1.325530	47.87	3.80	51.67
35	53.383267	-1.326130	49.34	3.80	53.14
36	53.383280	-1.327117	50.76	3.80	54.56
37	53.383599	-1.327439	52.75	3.80	56.55
38	53.381366	-1.328705	62.09	3.80	65.89
39	53.381629	-1.333877	73.79	3.80	77.59
40	53.383926	-1.334928	74.97	3.80	78.77
41	53.383990	-1.333684	72.36	3.80	76.16
42	53.384515	-1.333490	83.23	3.80	87.03
43	53.385526	-1.332418	86.45	3.80	90.25
44	53.385532	-1.331978	79.42	3.80	83.22
45	53.385225	-1.331227	73.25	3.80	77.05
46	53.386646	-1.328791	41.73	3.80	45.53
47	53.387753	-1.330304	40.65	3.80	44.45
48	53.388137	-1.331570	45.95	3.80	49.75
49	53.388597	-1.332160	45.59	3.80	49.39
50	53.388130	-1.333083	56.17	3.80	59.97
51	53.388930	-1.333769	48.52	3.80	52.32
52	53.389839	-1.335572	49.51	3.80	53.31
53	53.390334	-1.336478	51.76	3.80	55.56
54	53.390446	-1.337170	54.06	3.80	57.86
55	53.391089	-1.337203	51.01	3.80	54.81
56	53.391456	-1.337576	51.06	3.80	54.86

Route Receptors

Name: PRoW 1B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.396225	-1.324512	72.13	2.50	74.63
2	53.396958	-1.327462	61.99	2.50	64.49
3	53.396906	-1.327977	60.93	2.50	63.43
4	53.398656	-1.331470	44.22	2.50	46.72
5	53.397792	-1.332929	39.70	2.50	42.20
6	53.396897	-1.334742	30.00	2.50	32.50

Name: PRoW 2B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.394815	-1.324646	65.57	2.50	68.07
2	53.393829	-1.326920	52.56	2.50	55.06
3	53.392755	-1.329409	37.76	2.50	40.26
4	53.391789	-1.331856	28.56	2.50	31.06
5	53.391492	-1.334830	39.53	2.50	42.03
6	53.390689	-1.337469	54.87	2.50	57.37
7	53.390808	-1.338658	64.92	2.50	67.42
8	53.390458	-1.339277	73.11	2.50	75.61
9	53.390781	-1.340122	80.05	2.50	82.55
10	53.391526	-1.340852	81.00	2.50	83.50
11	53.390794	-1.343668	70.14	2.50	72.64
12	53.390608	-1.345186	55.66	2.50	58.16
13	53.390778	-1.345455	52.40	2.50	54.90

Name: PRoW 5B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.389201	-1.349242	34.97	2.50	37.47
2	53.390845	-1.350315	31.67	2.50	34.17
3	53.392477	-1.351645	28.35	2.50	30.85
4	53.392509	-1.348952	31.73	2.50	34.23
5	53.393814	-1.347965	32.08	2.50	34.58
6	53.395528	-1.347086	28.79	2.50	31.29

Name: Route 1B - Part 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395594	-1.336708	29.84	1.50	31.34
2	53.394904	-1.339143	39.12	1.50	40.62
3	53.394846	-1.342244	47.47	1.50	48.97
4	53.394961	-1.344250	50.63	1.50	52.13
5	53.393822	-1.345195	56.73	1.50	58.23
6	53.392005	-1.345044	58.08	1.50	59.58
7	53.390828	-1.345259	53.45	1.50	54.95
8	53.389843	-1.347598	42.80	1.50	44.30
9	53.388614	-1.349829	36.46	1.50	37.96
10	53.386938	-1.350841	46.58	1.50	48.08

Name: Route 1B - Part 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382913	-1.343803	58.20	1.50	59.70
2	53.382394	-1.340971	71.56	1.50	73.06
3	53.381933	-1.337967	78.88	1.50	80.38
4	53.380653	-1.335799	83.81	1.50	85.31
5	53.379847	-1.334576	89.22	1.50	90.72
6	53.379489	-1.331680	84.08	1.50	85.58
7	53.379054	-1.328697	84.66	1.50	86.16
8	53.378529	-1.325779	77.32	1.50	78.82
9	53.377786	-1.323440	79.08	1.50	80.58
10	53.377057	-1.320736	79.96	1.50	81.46
11	53.376948	-1.318430	77.73	1.50	79.23

Name: Route 2B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.396256	-1.324407	72.45	1.50	73.95
2	53.394478	-1.324428	62.88	1.50	64.38
3	53.392661	-1.324407	58.75	1.50	60.25
4	53.390856	-1.323977	62.50	1.50	64.00
5	53.389052	-1.323420	55.97	1.50	57.47
6	53.387299	-1.322883	48.50	1.50	50.00
7	53.385546	-1.322411	40.57	1.50	42.07
8	53.383728	-1.322025	47.67	1.50	49.17
9	53.382020	-1.321081	57.39	1.50	58.89
10	53.380407	-1.319664	66.22	1.50	67.72
11	53.378635	-1.319292	73.30	1.50	74.80
12	53.376842	-1.318905	79.80	1.50	81.30
13	53.375102	-1.318519	84.48	1.50	85.98

Name: Route 3B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.386116	-1.322498	43.37	1.50	44.87
2	53.384920	-1.320310	49.69	1.50	51.19
3	53.384337	-1.318411	55.66	1.50	57.16
4	53.384670	-1.316447	54.04	1.50	55.54
5	53.383973	-1.315224	56.16	1.50	57.66
6	53.383269	-1.315857	57.41	1.50	58.91
7	53.382098	-1.315364	57.59	1.50	59.09
8	53.381566	-1.313797	61.45	1.50	62.95
9	53.381477	-1.310729	78.40	1.50	79.90
10	53.381477	-1.308530	93.29	1.50	94.79

Name: Route 4B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395735	-1.354576	34.41	2.75	37.16
2	53.393943	-1.354576	27.80	2.75	30.55
3	53.392152	-1.354876	33.49	2.75	36.24
4	53.390437	-1.355155	32.81	2.75	35.56
5	53.388582	-1.355477	34.62	2.75	37.37
6	53.386803	-1.355799	35.86	2.75	38.61
7	53.385613	-1.355799	36.44	2.75	39.19

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.395723	-1.323251	75.69	2.00
OP 2	2	53.393443	-1.326161	53.66	2.00
OP 3	3	53.388065	-1.322144	59.41	2.00
OP 4	4	53.382396	-1.310768	85.66	2.00
OP 5	5	53.376743	-1.318369	78.10	2.00
OP 6	6	53.377135	-1.322285	80.00	2.00
OP 7	7	53.381836	-1.338481	77.23	2.00
OP 8	8	53.381318	-1.341784	62.25	2.00
OP 9	9	53.383436	-1.342621	59.05	2.00
OP 10	10	53.385789	-1.344533	56.59	2.00
OP 11	11	53.388101	-1.347958	41.32	2.00
OP 12	12	53.389273	-1.345874	56.98	2.00
OP 13	13	53.390173	-1.346228	50.39	2.00
OP 14	14	53.390601	-1.345689	51.81	2.00
OP 15	15	53.391019	-1.337957	58.00	2.00
OP 16	16	53.392306	-1.348503	34.63	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 14	8.0	180.0	138,555	2,309.2	87,513	1,458.5	-
WS2 - 15	8.0	180.0	128,435	2,140.6	136,136	2,268.9	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1B	709	11.8	121	2.0
PRoW 2B	219,951	3,665.8	157,469	2,624.5
PRoW 5B	1,881	31.4	942	15.7
Route 1B - Part 1	3,277	54.6	5,004	83.4
Route 1B - Part 2	2,156	35.9	4,446	74.1
Route 2B	818	13.6	4,543	75.7
Route 3B	3,378	56.3	8,483	141.4
Route 4B	250	4.2	51	0.8
OP 1	1,214	20.2	15	0.2
OP 2	2,422	40.4	1,090	18.2
OP 3	2,755	45.9	5,802	96.7
OP 4	3,980	66.3	3,667	61.1
OP 5	1,074	17.9	0	0.0
OP 6	39	0.7	0	0.0
OP 7	1,239	20.6	4,130	68.8
OP 8	1,727	28.8	3,437	57.3
OP 9	2,164	36.1	2,355	39.2
OP 10	4,428	73.8	3,010	50.2
OP 11	4,168	69.5	2,656	44.3
OP 12	2,824	47.1	4,621	77.0
OP 13	1,616	26.9	3,532	58.9
OP 14	1,376	22.9	3,735	62.2
OP 15	516	8.6	3,543	59.0
OP 16	3,028	50.5	997	16.6

PV: WS2 - 14 potential temporary after-image

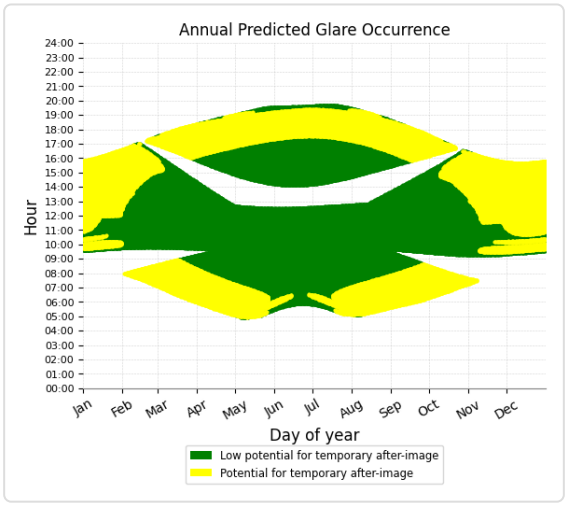
Receptor results ordered by category of glare

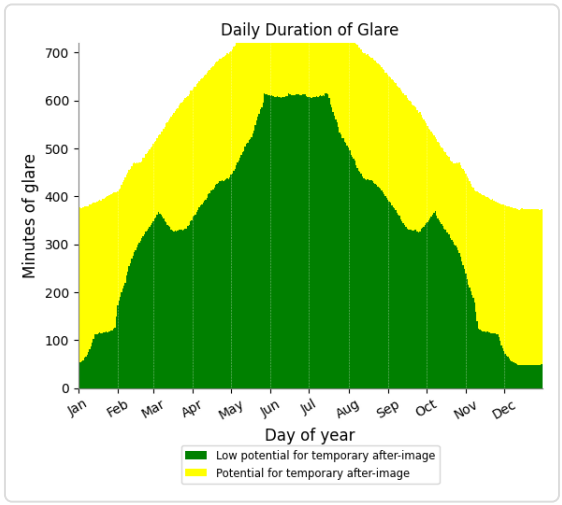
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2B	126,170	2,102.8	82,862	1,381.0
Route 1B - Part 1	1,977	33.0	738	12.3
Route 2B	674	11.2	1,371	22.9
Route 3B	2,734	45.6	711	11.8
PRoW 1B	0	0.0	0	0.0
PRoW 5B	0	0.0	0	0.0
Route 1B - Part 2	0	0.0	0	0.0
Route 4B	0	0.0	0	0.0
OP 4	1,564	26.1	128	2.1
OP 10	1,951	32.5	633	10.6
OP 12	1,593	26.6	1,070	17.8
OP 3	216	3.6	0	0.0
OP 11	1,676	27.9	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0

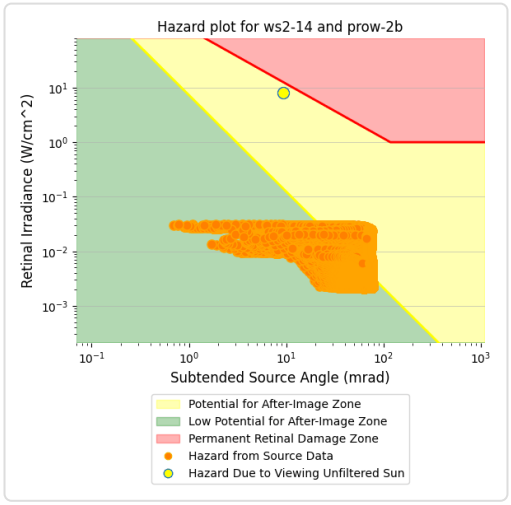
WS2 - 14 and Route: PRoW 2B

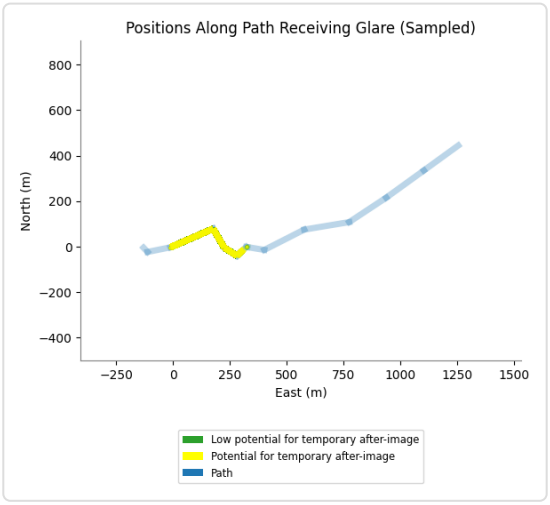
Yellow glare: 82,862 min.

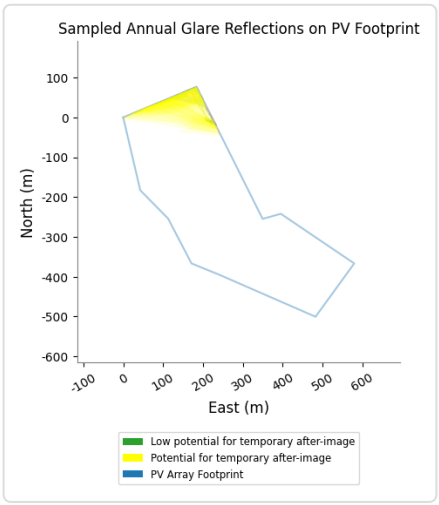
Green glare: 126,170 min.







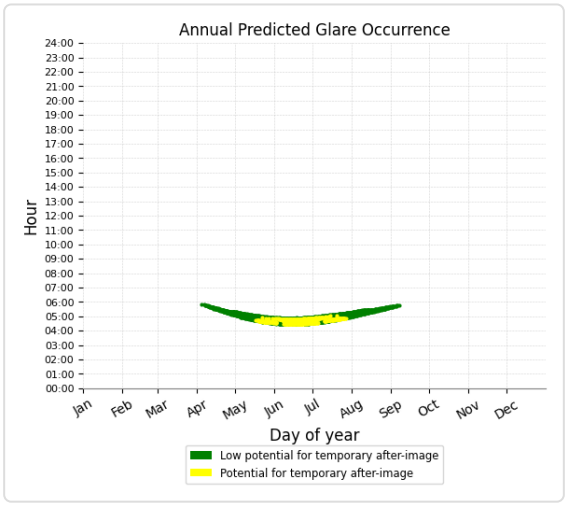


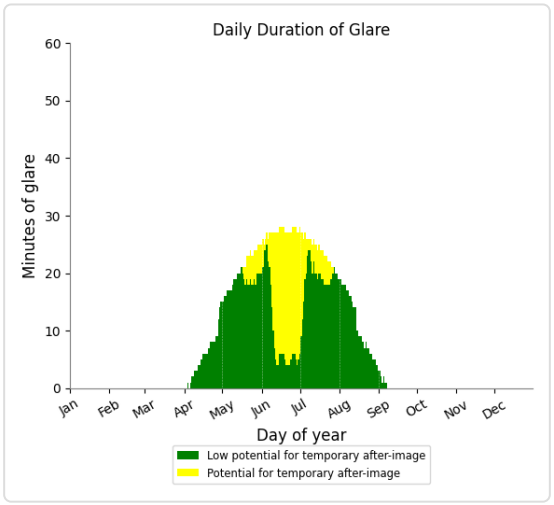


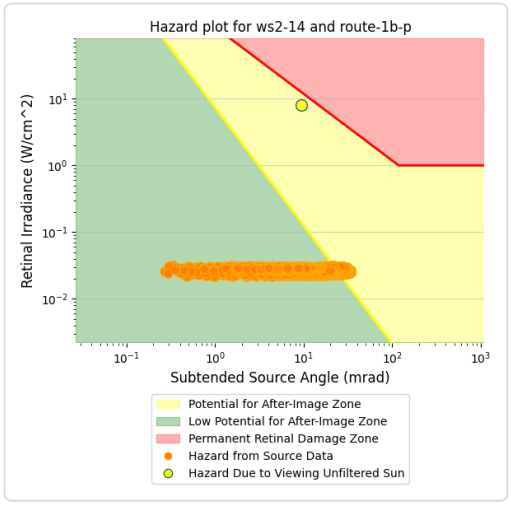
WS2 - 14 and Route: Route 1B - Part 1

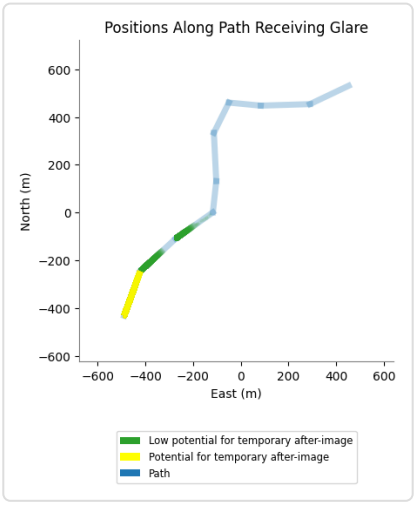
Yellow glare: 738 min.

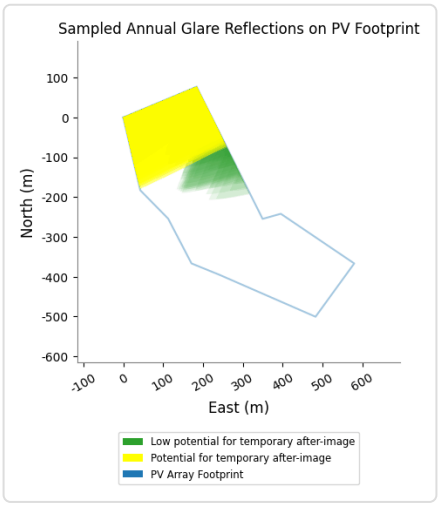
Green glare: 1,977 min.







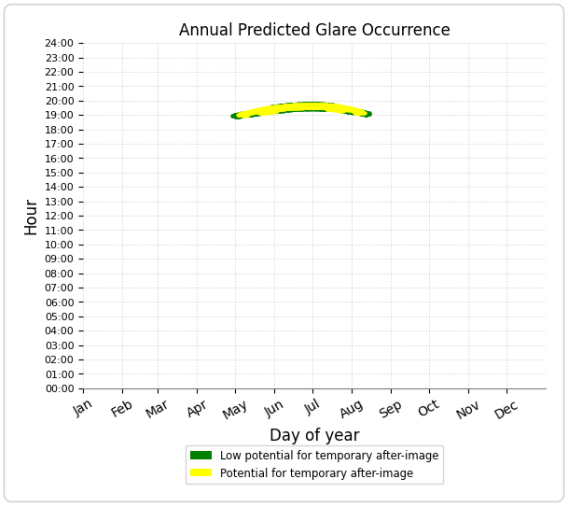


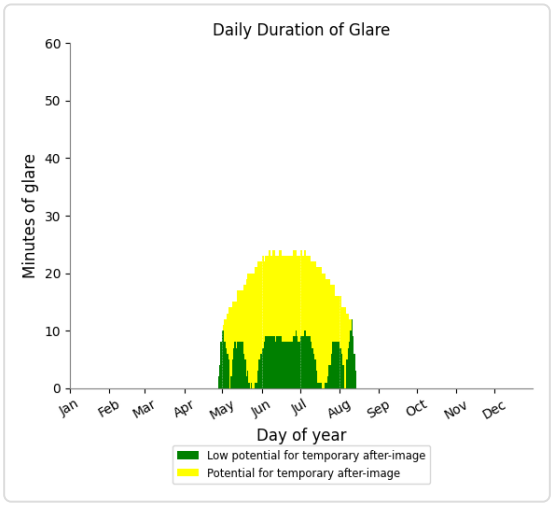


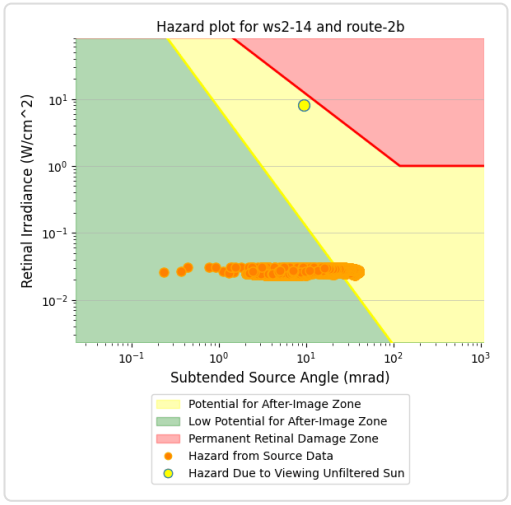
WS2 - 14 and Route: Route 2B

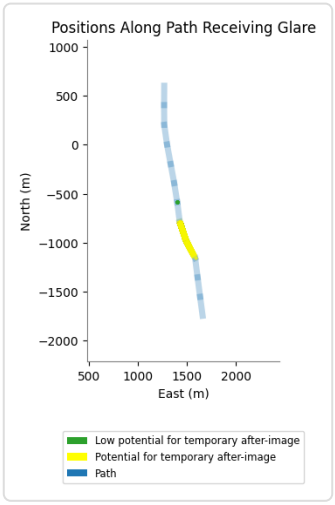
Yellow glare: 1,371 min.

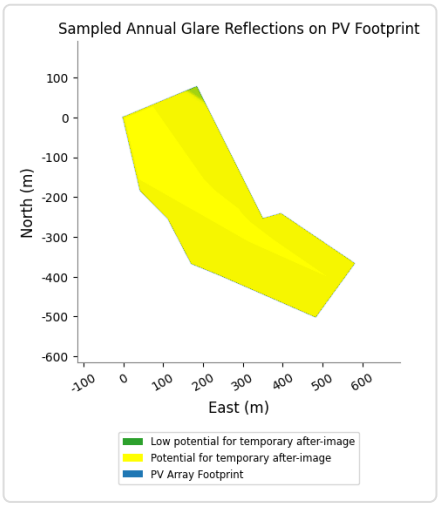
Green glare: 674 min.







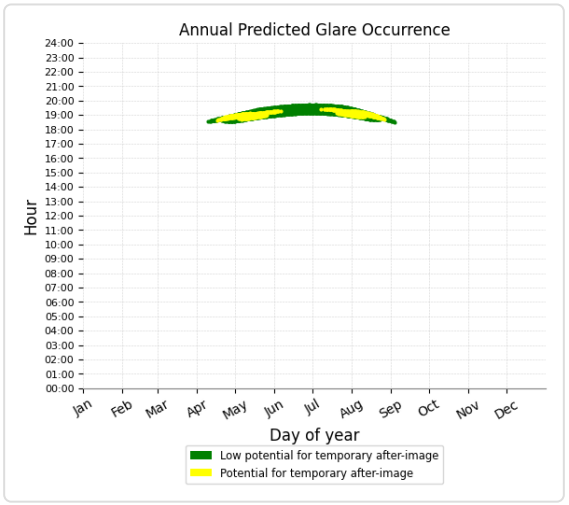


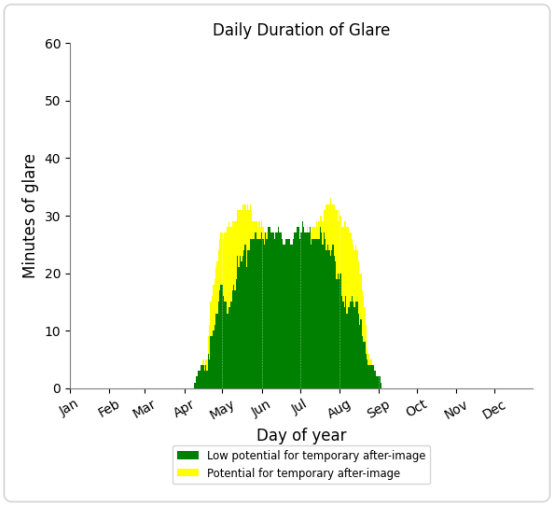


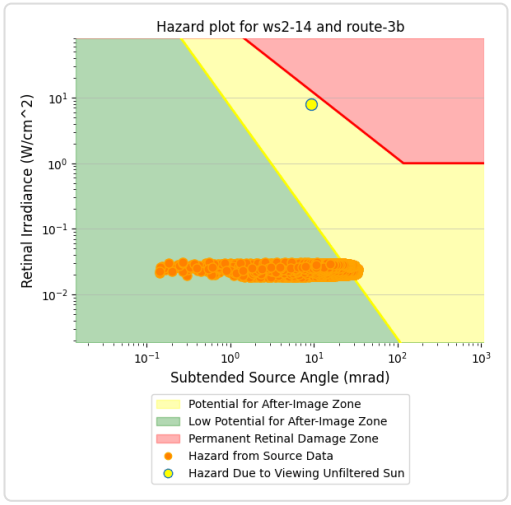
WS2 - 14 and Route: Route 3B

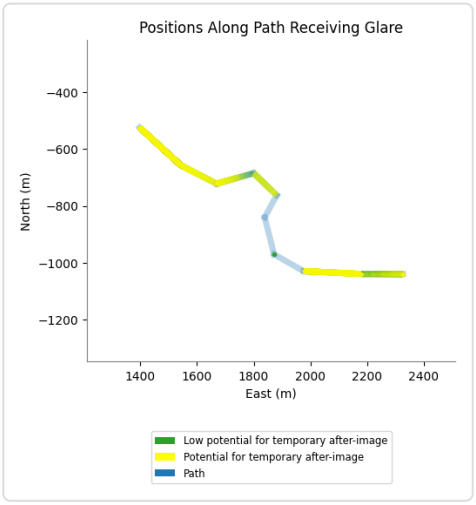
Yellow glare: 711 min.

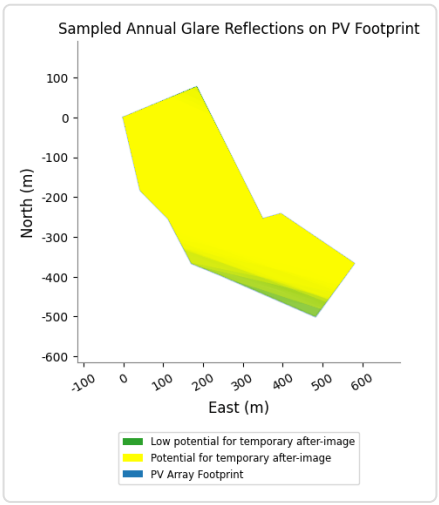
Green glare: 2,734 min.











WS2 - 14 and Route: PRoW 1B

No glare found

WS2 - 14 and Route: PRoW 5B

No glare found

WS2 - 14 and Route: Route 1B - Part 2

No glare found

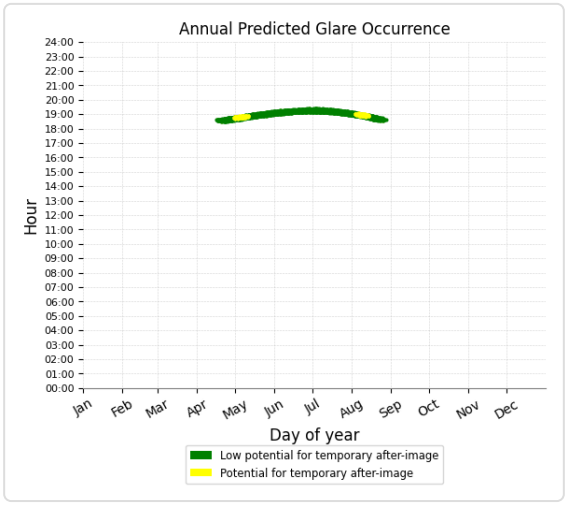
WS2 - 14 and Route: Route 4B

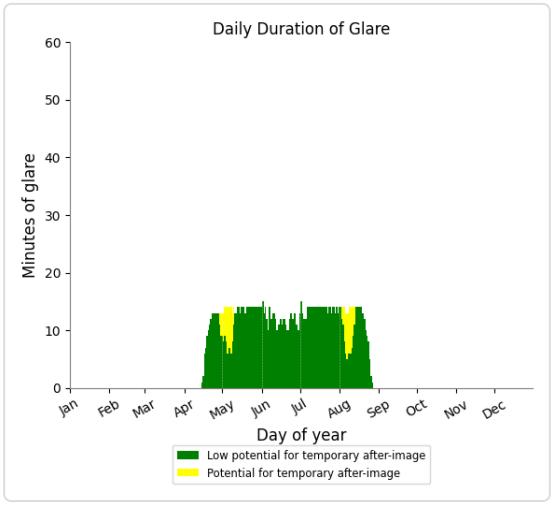
No glare found

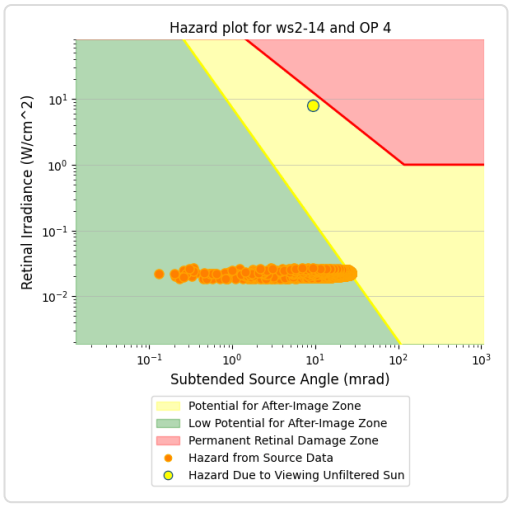
WS2 - 14 and OP 4

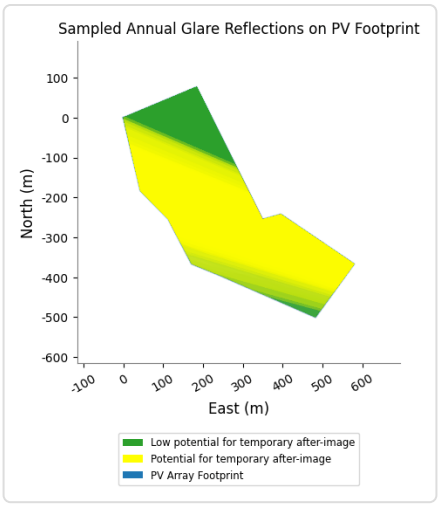
Yellow glare: 128 min.

Green glare: 1,564 min.





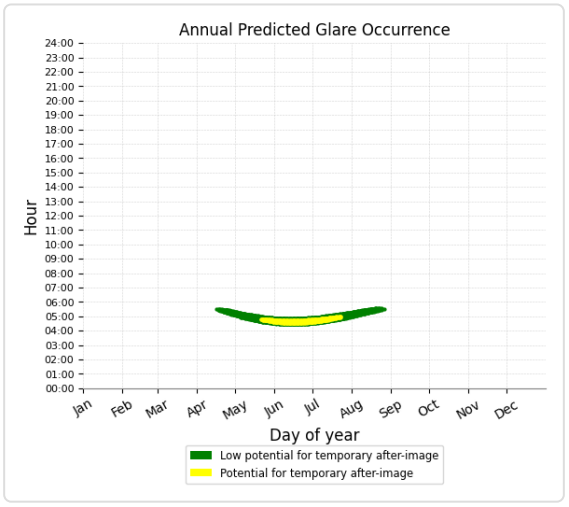


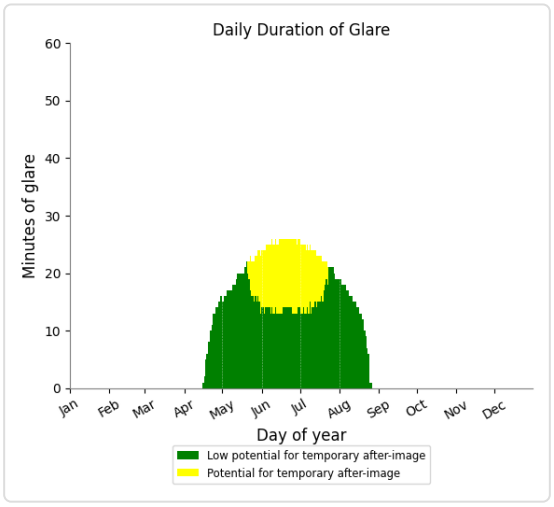


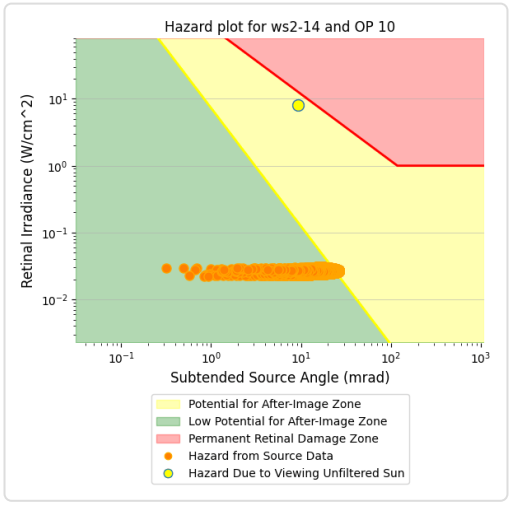
WS2 - 14 and OP 10

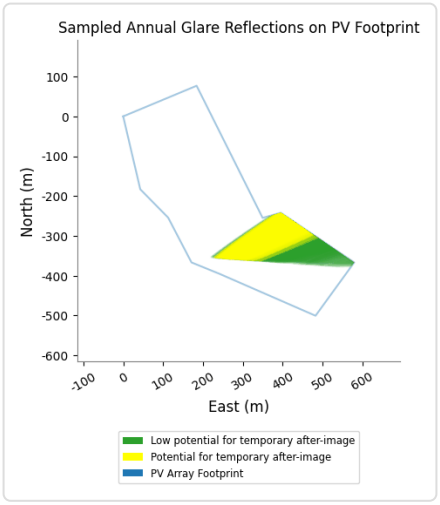
Yellow glare: 633 min.

Green glare: 1,951 min.





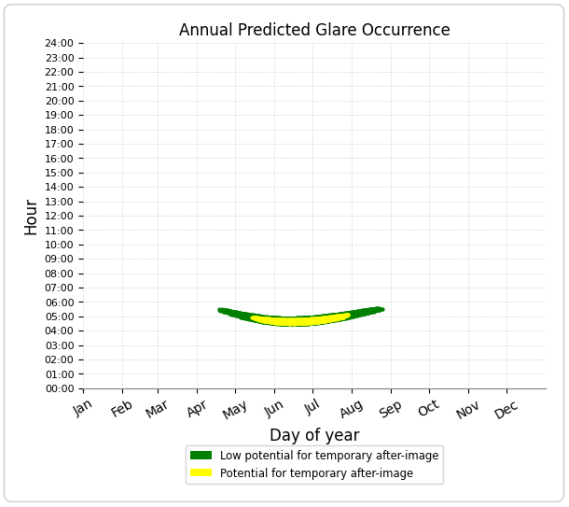


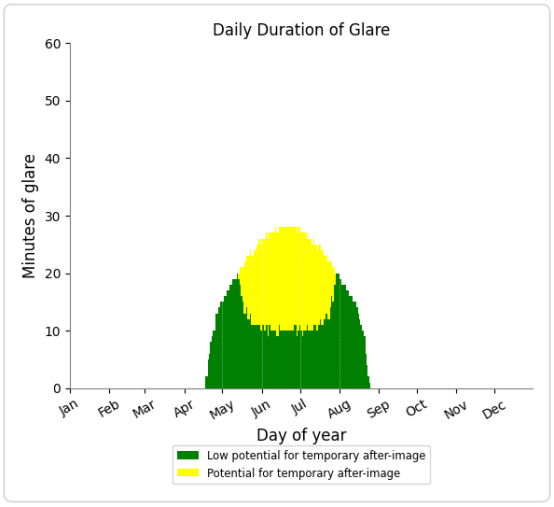


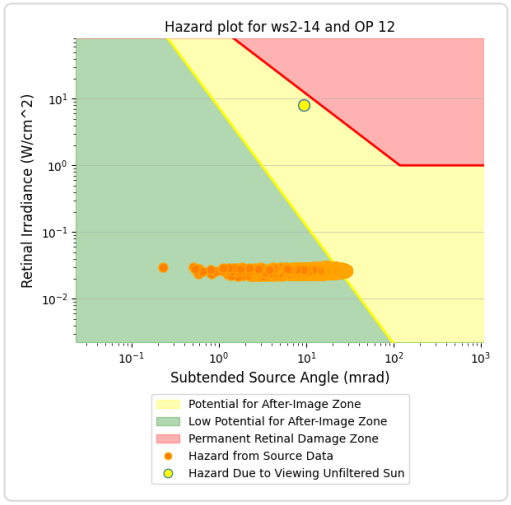
WS2 - 14 and OP 12

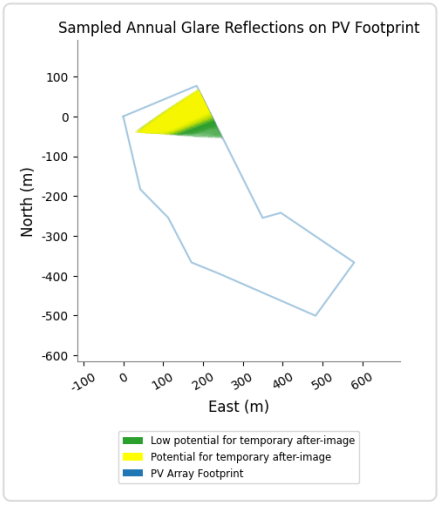
Yellow glare: 1,070 min.

Green glare: 1,593 min.





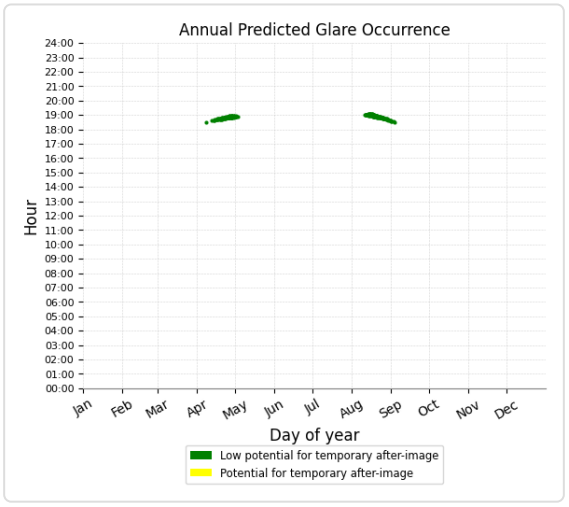


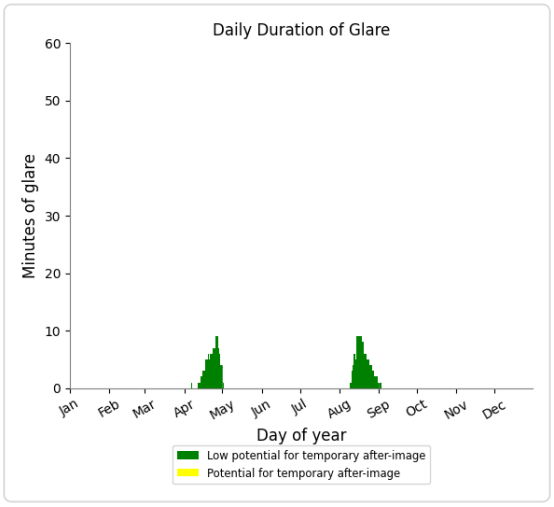


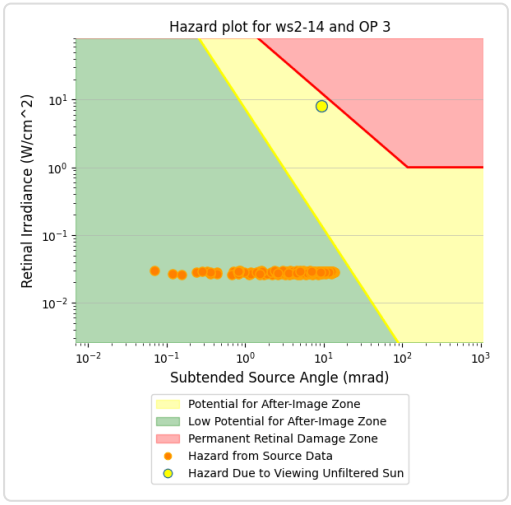
WS2 - 14 and OP 3

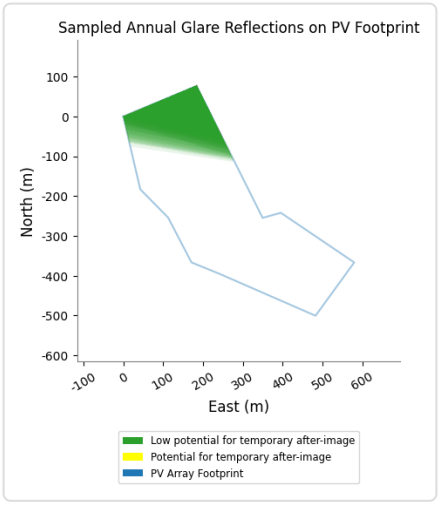
Yellow glare: none

Green glare: 216 min.





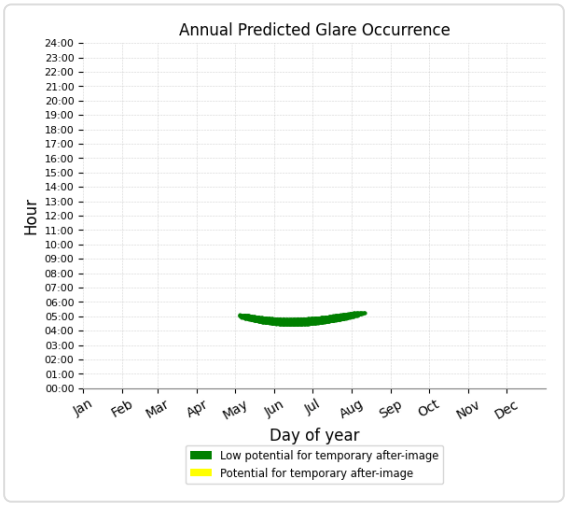


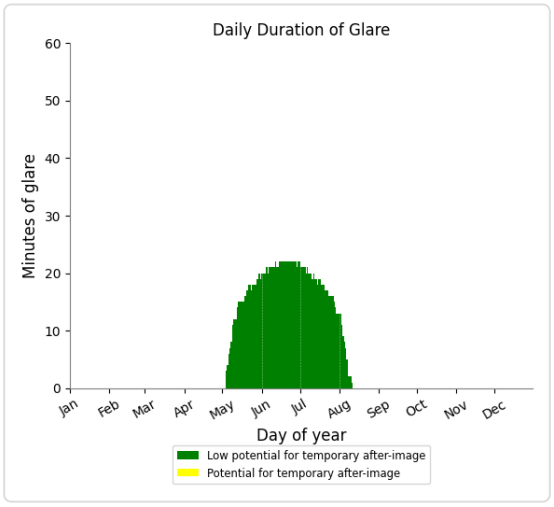


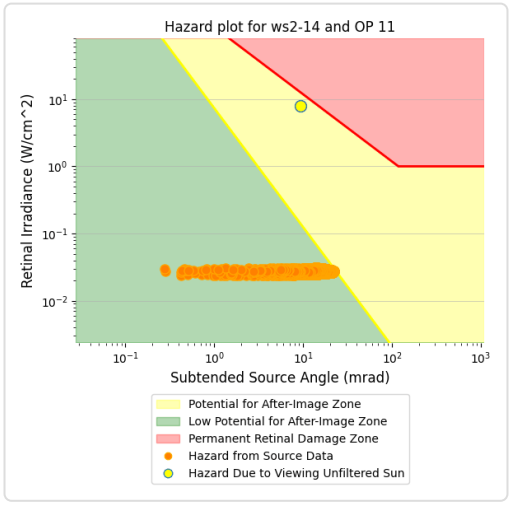
WS2 - 14 and OP 11

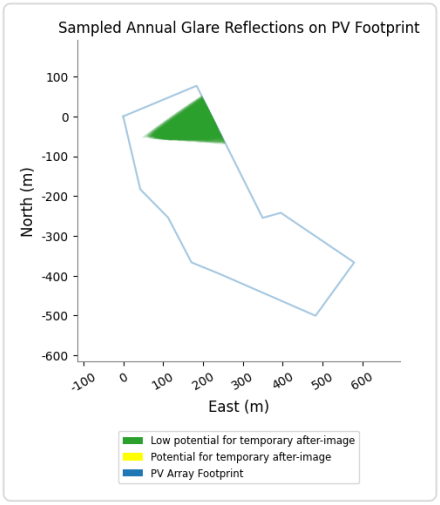
Yellow glare: none

Green glare: 1,676 min.









WS2 - 14 and OP 1

No glare found

WS2 - 14 and OP 2

No glare found

WS2 - 14 and OP 5

No glare found

WS2 - 14 and OP 6

No glare found

WS2 - 14 and OP 7

No glare found

WS2 - 14 and OP 8

No glare found

WS2 - 14 and OP 9

No glare found

WS2 - 14 and OP 13

No glare found

WS2 - 14 and OP 14

No glare found

WS2 - 14 and OP 15

No glare found

WS2 - 14 and OP 16

No glare found

PV: WS2 - 15 potential temporary after-image

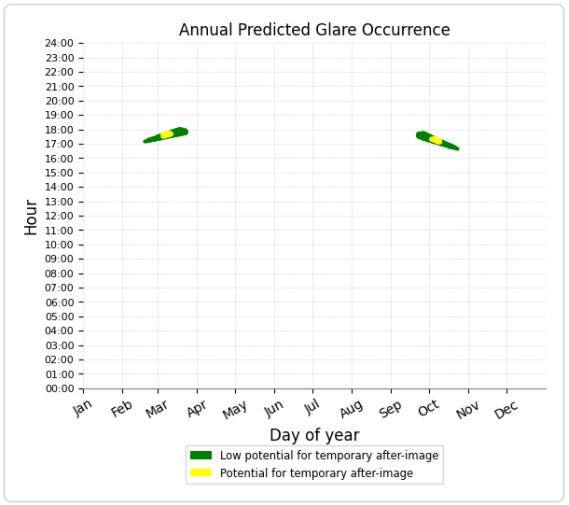
Receptor results ordered by category of glare

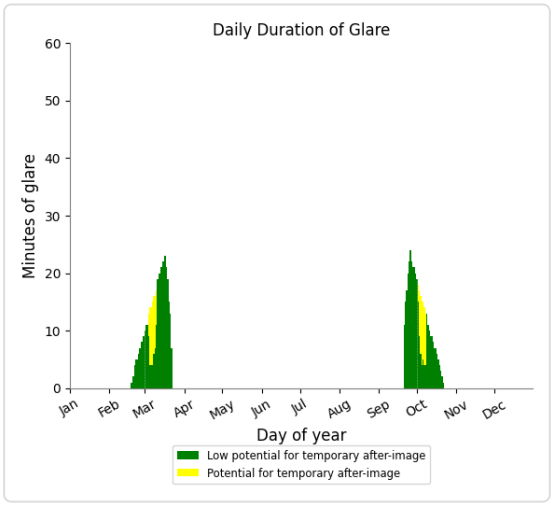
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1B	709	11.8	121	2.0
PRoW 2B	93,781	1,563.0	74,607	1,243.5
PRoW 5B	1,881	31.4	942	15.7
Route 1B - Part 1	1,300	21.7	4,266	71.1
Route 1B - Part 2	2,156	35.9	4,446	74.1
Route 2B	144	2.4	3,172	52.9
Route 3B	644	10.7	7,772	129.5
Route 4B	250	4.2	51	0.8
OP 1	1,214	20.2	15	0.2
OP 2	2,422	40.4	1,090	18.2
OP 3	2,539	42.3	5,802	96.7
OP 4	2,416	40.3	3,539	59.0
OP 7	1,239	20.6	4,130	68.8
OP 8	1,727	28.8	3,437	57.3
OP 9	2,164	36.1	2,355	39.2
OP 10	2,477	41.3	2,377	39.6
OP 11	2,492	41.5	2,656	44.3
OP 12	1,231	20.5	3,551	59.2
OP 13	1,616	26.9	3,532	58.9
OP 14	1,376	22.9	3,735	62.2
OP 15	516	8.6	3,543	59.0
OP 16	3,028	50.5	997	16.6
OP 5	1,074	17.9	0	0.0
OP 6	39	0.7	0	0.0

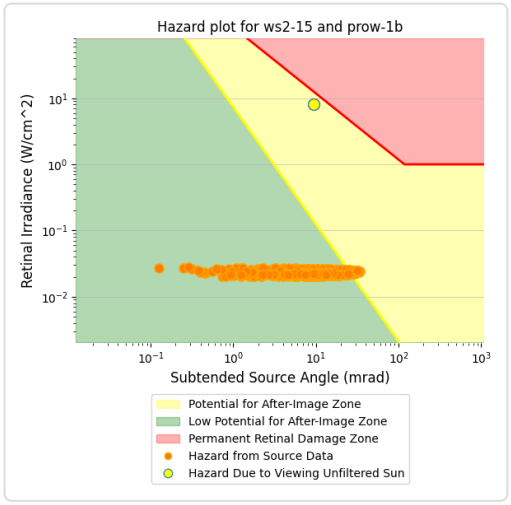
WS2 - 15 and Route: PRoW 1B

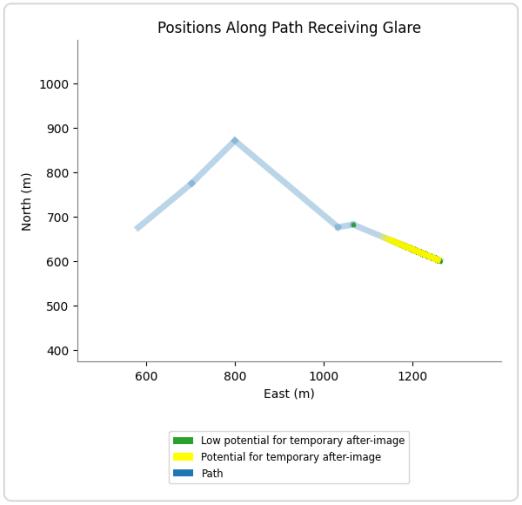
Yellow glare: 121 min.

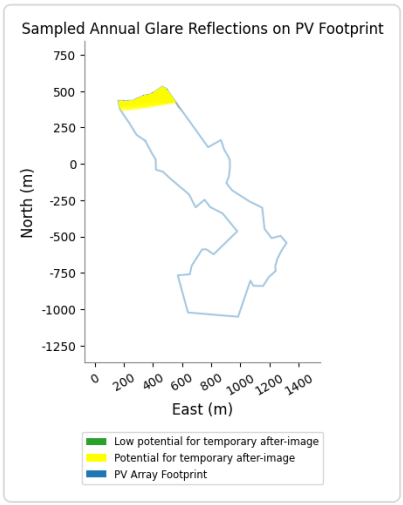
Green glare: 709 min.







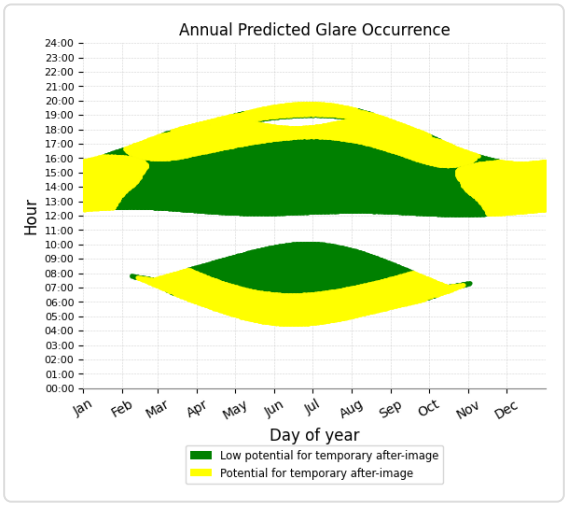


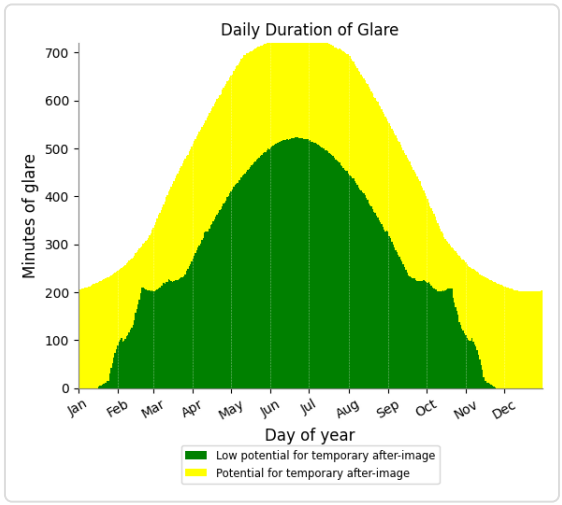


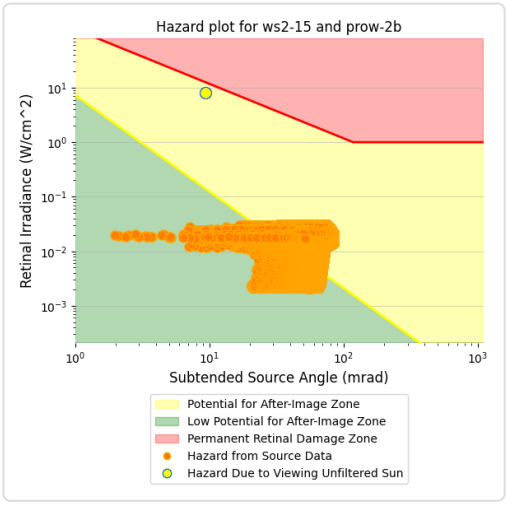
WS2 - 15 and Route: PRoW 2B

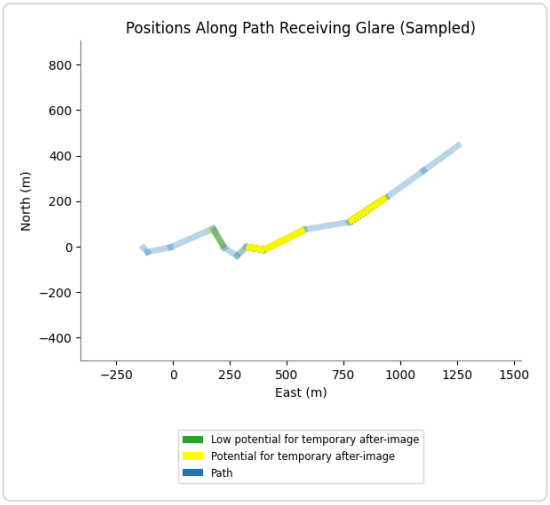
Yellow glare: 74,607 min.

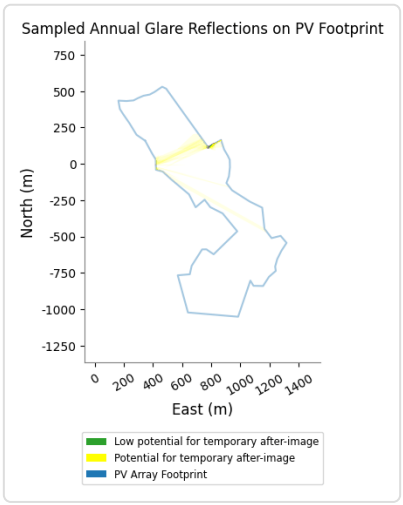
Green glare: 93,781 min.







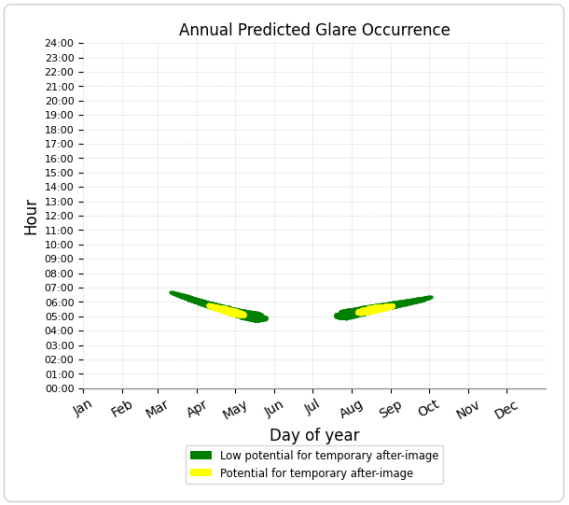


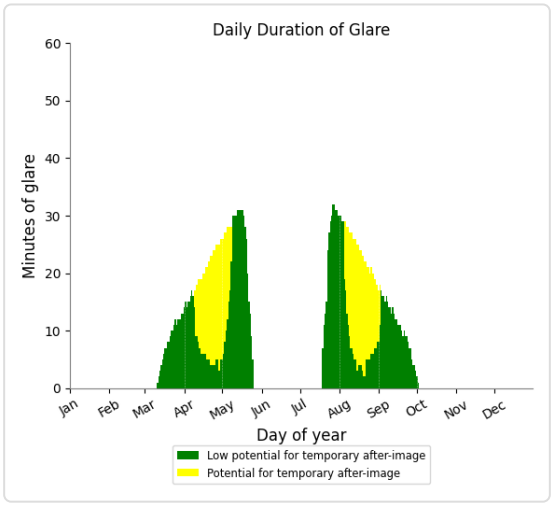


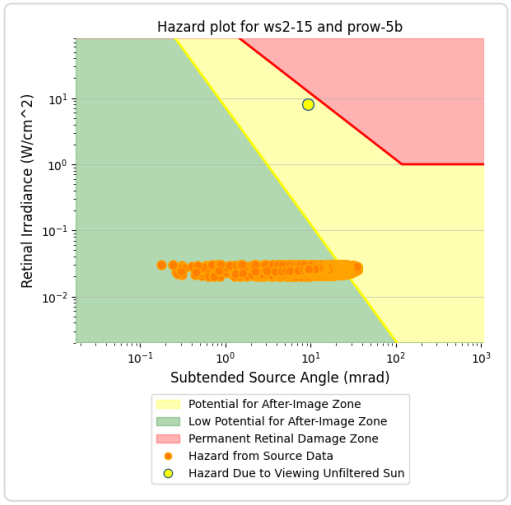
WS2 - 15 and Route: PRoW 5B

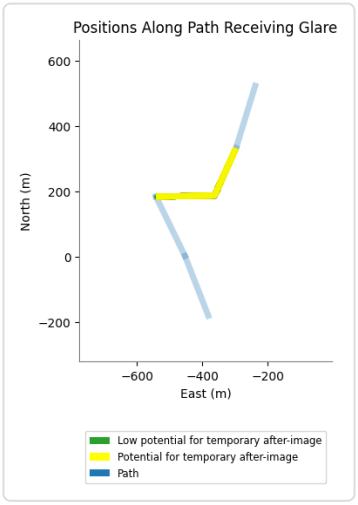
Yellow glare: 942 min.

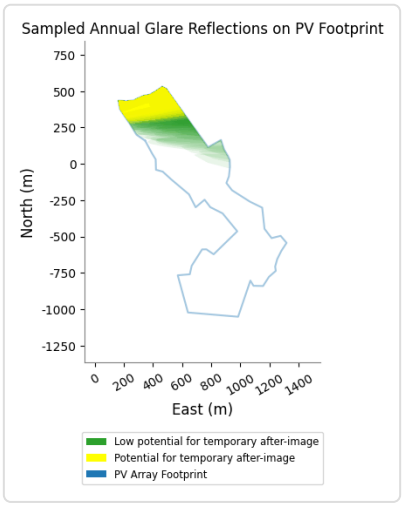
Green glare: 1,881 min.







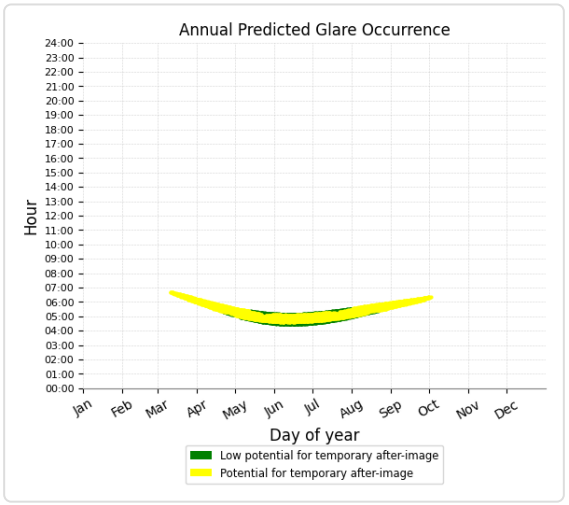


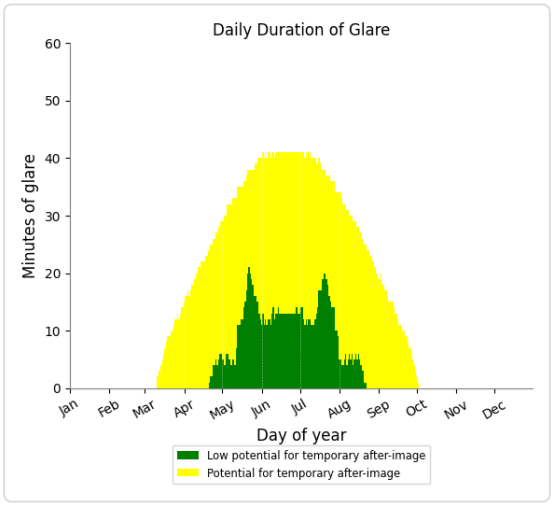


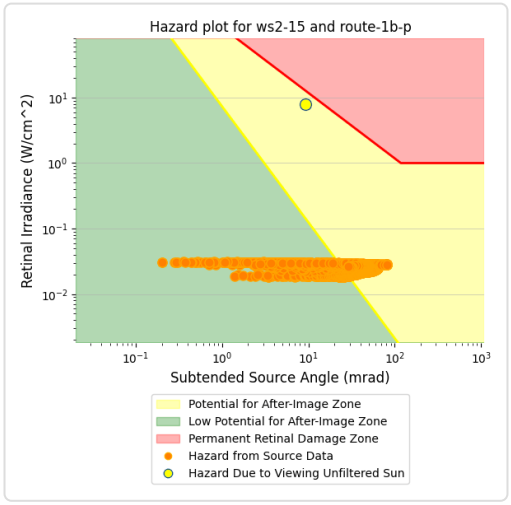
WS2 - 15 and Route: Route 1B - Part 1

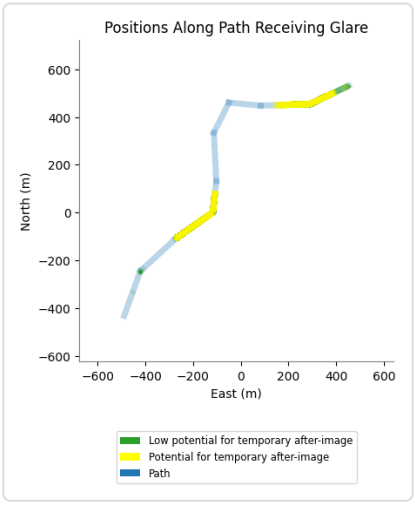
Yellow glare: 4,266 min.

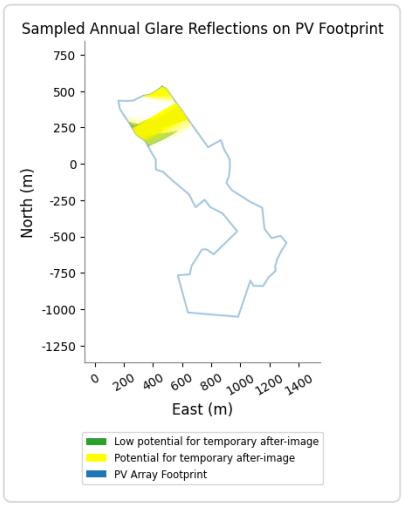
Green glare: 1,300 min.







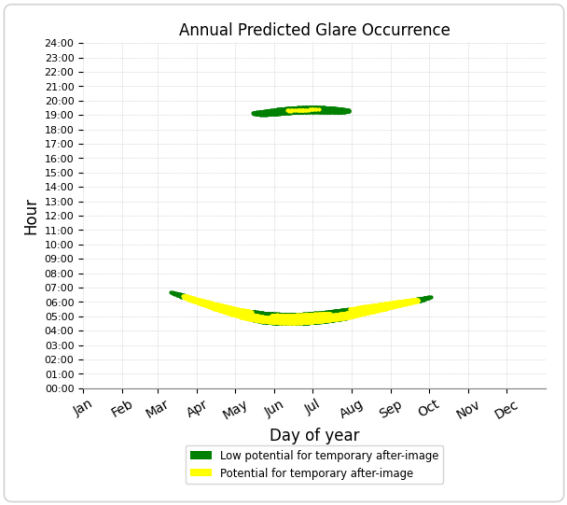


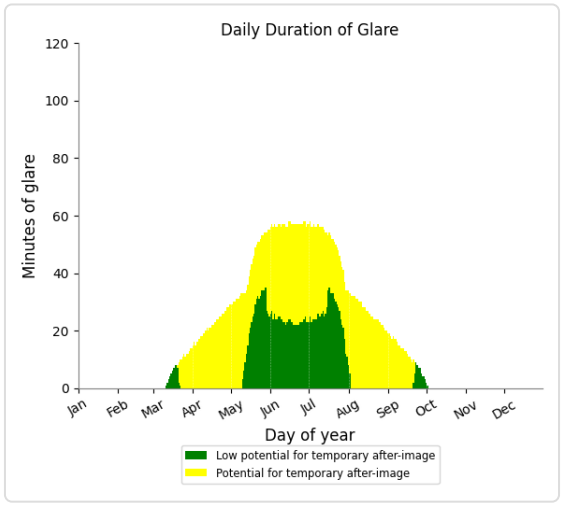


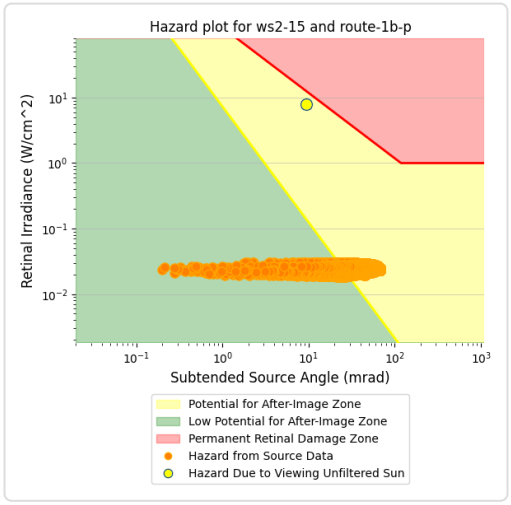
WS2 - 15 and Route: Route 1B - Part 2

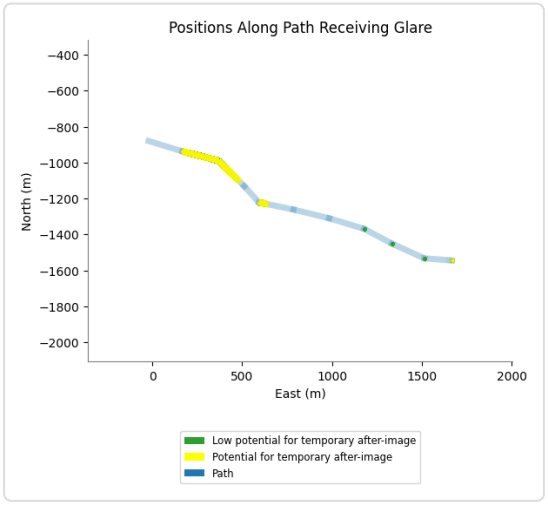
Yellow glare: 4,446 min.

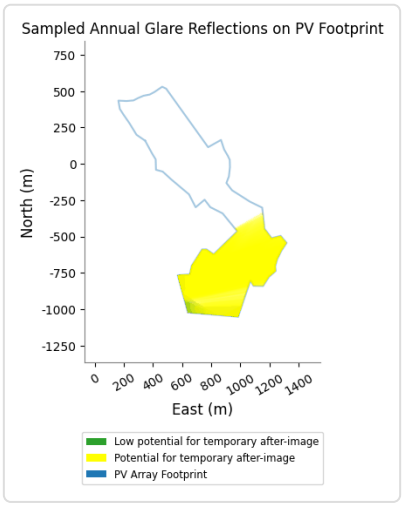
Green glare: 2,156 min.







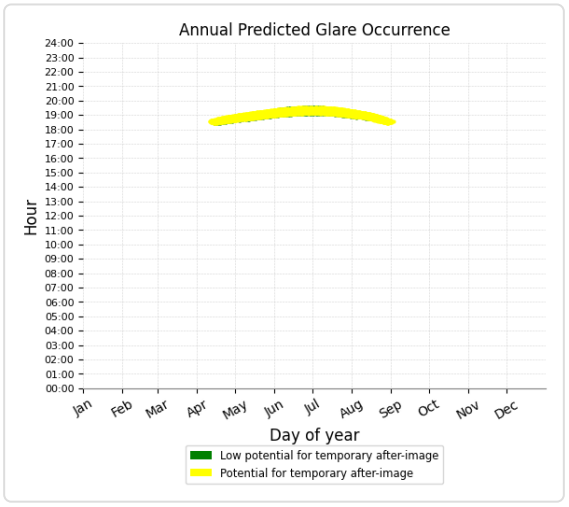


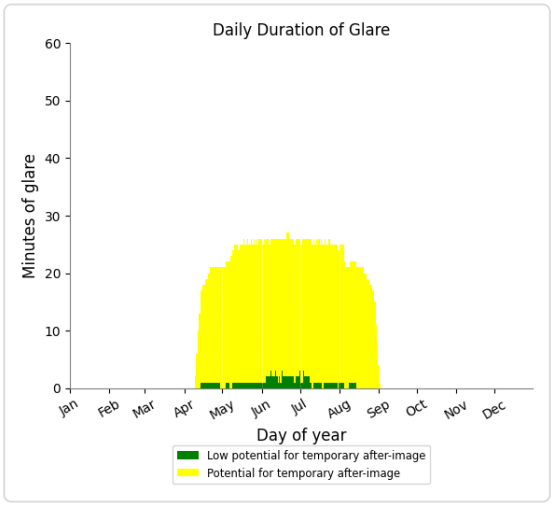


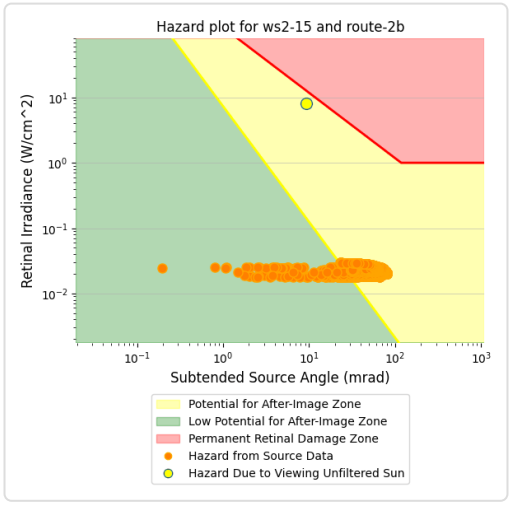
WS2 - 15 and Route: Route 2B

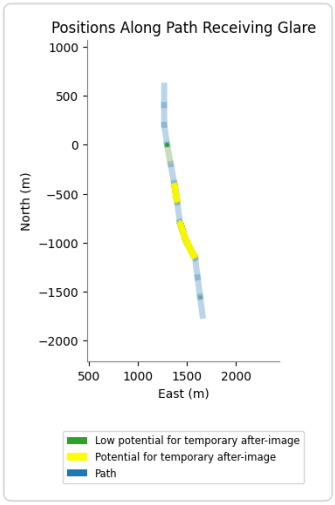
Yellow glare: 3,172 min.

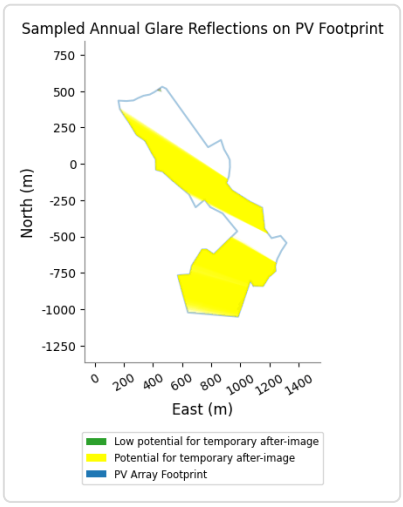
Green glare: 144 min.







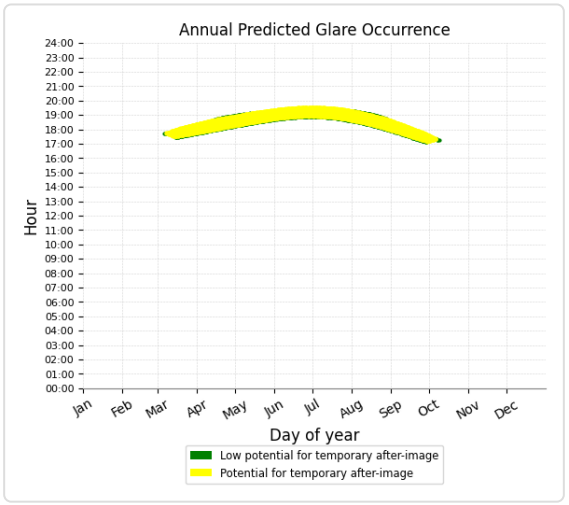


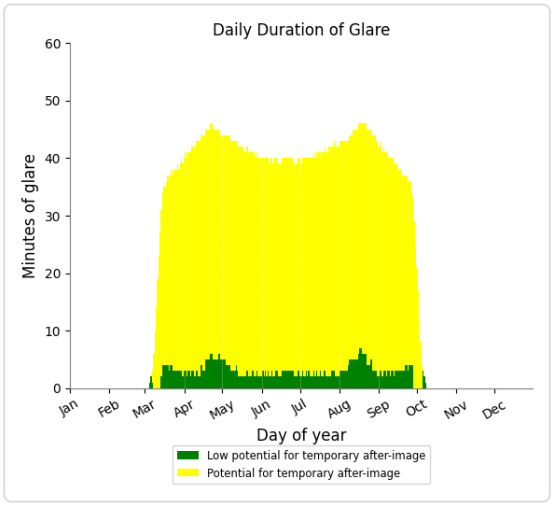


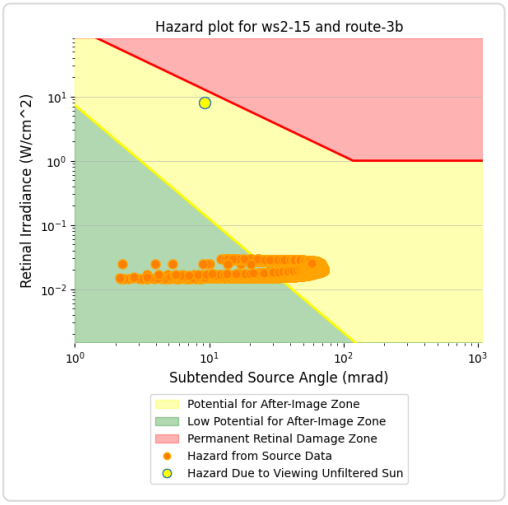
WS2 - 15 and Route: Route 3B

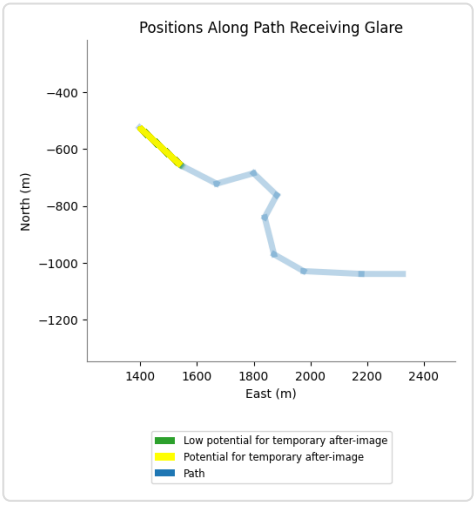
Yellow glare: 7,772 min.

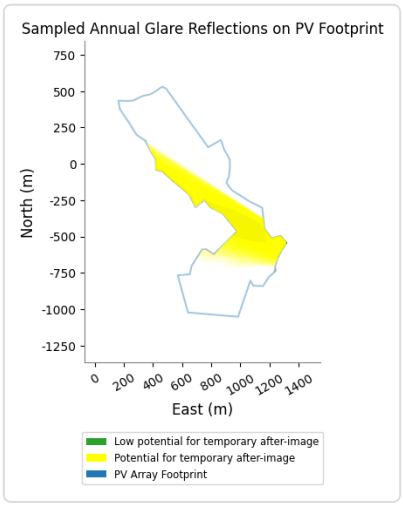
Green glare: 644 min.







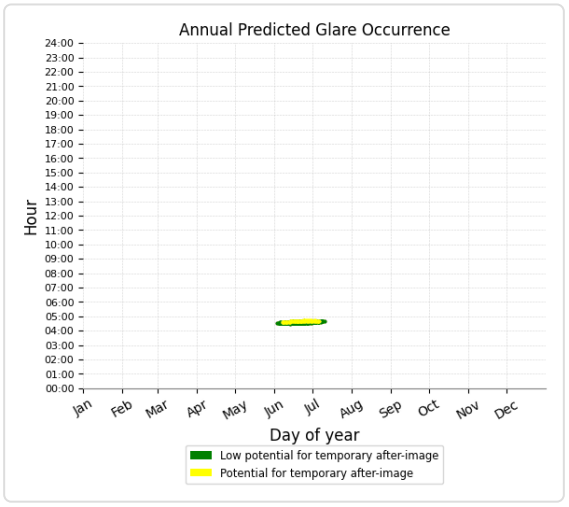


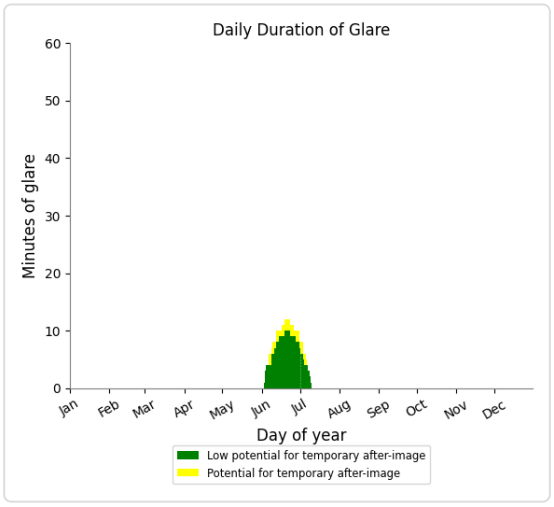


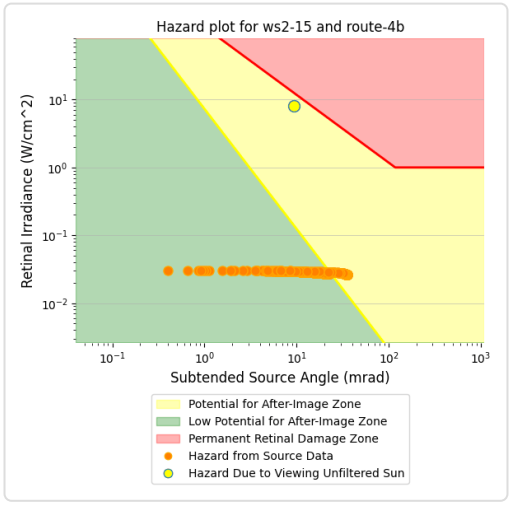
WS2 - 15 and Route: Route 4B

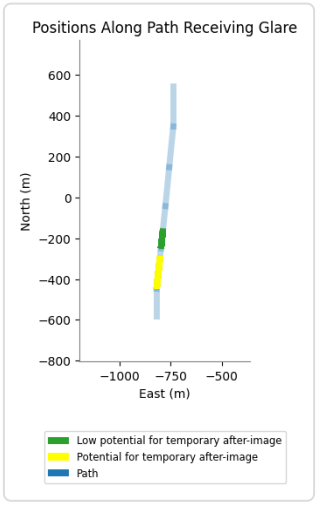
Yellow glare: 51 min.

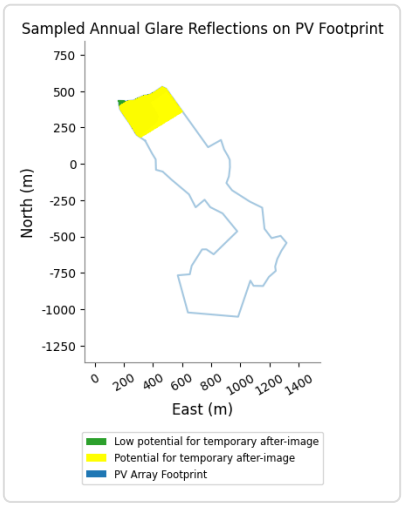
Green glare: 250 min.







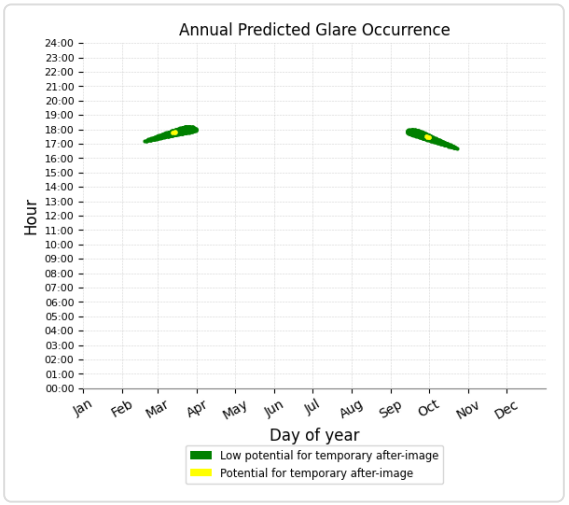


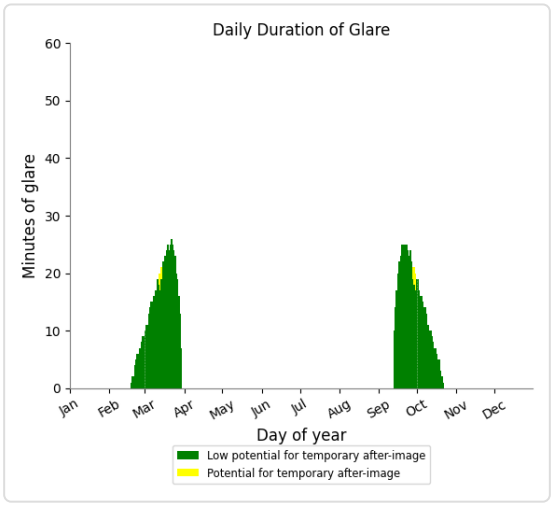


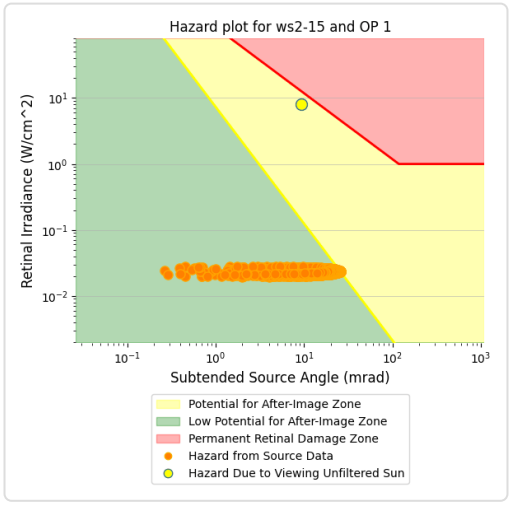
WS2 - 15 and OP 1

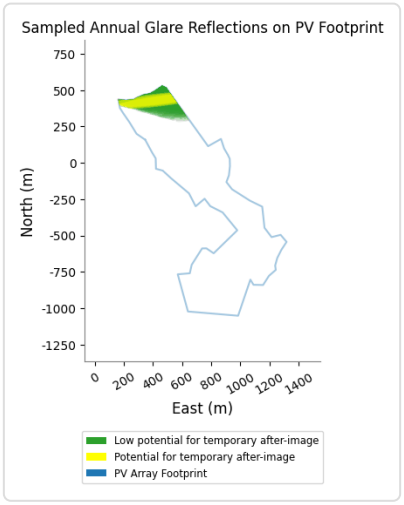
Yellow glare: 15 min.

Green glare: 1,214 min.





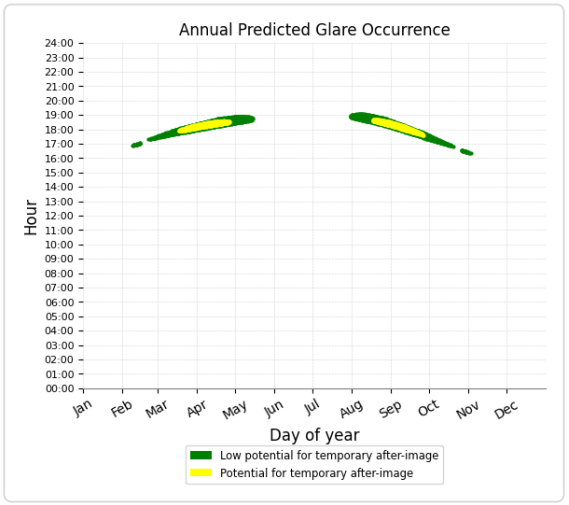


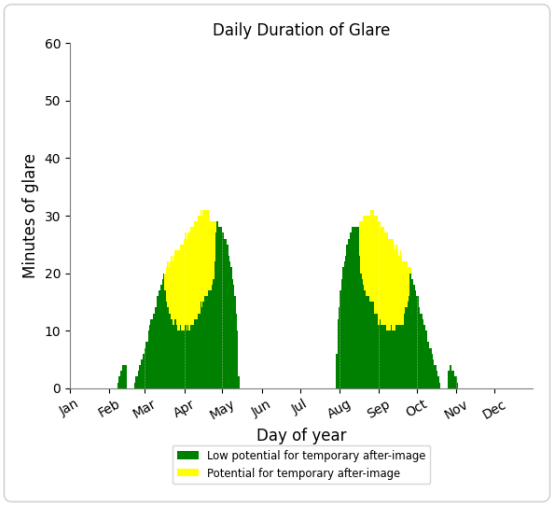


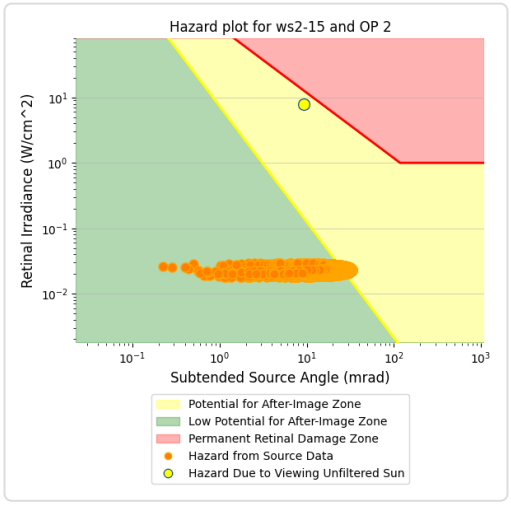
WS2 - 15 and OP 2

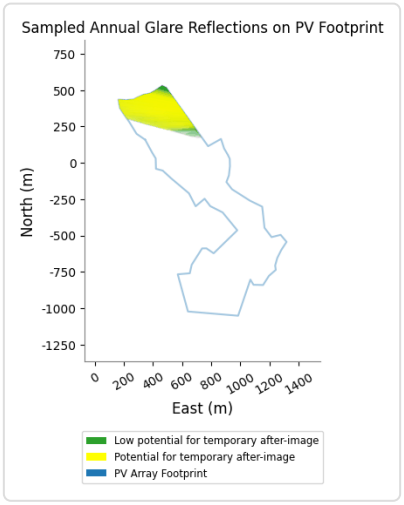
Yellow glare: 1,090 min.

Green glare: 2,422 min.





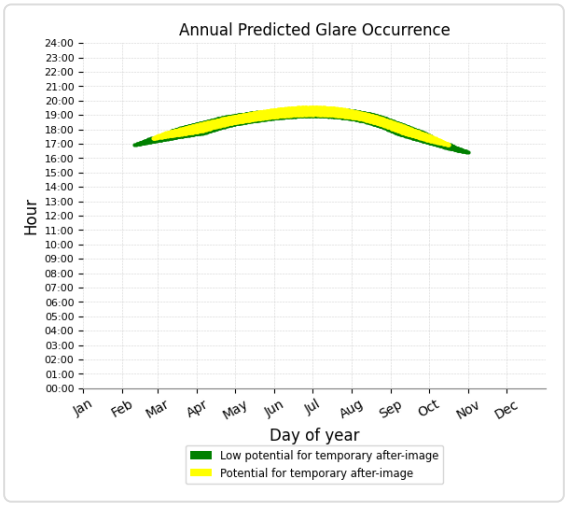


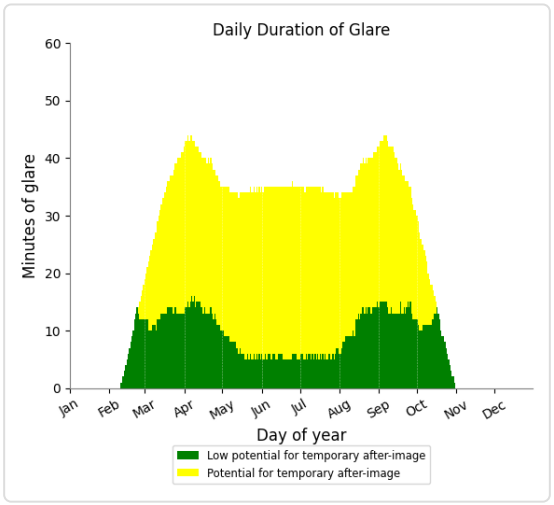


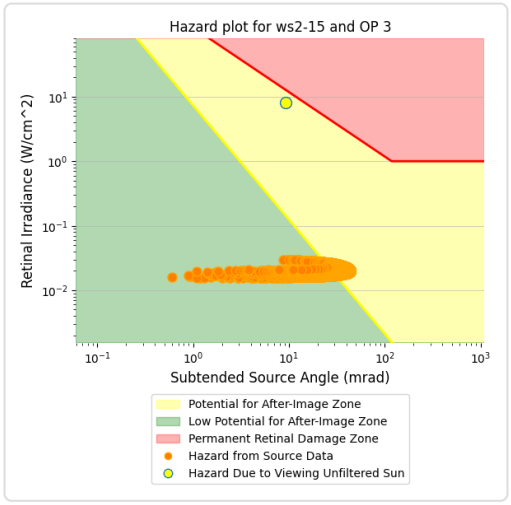
WS2 - 15 and OP 3

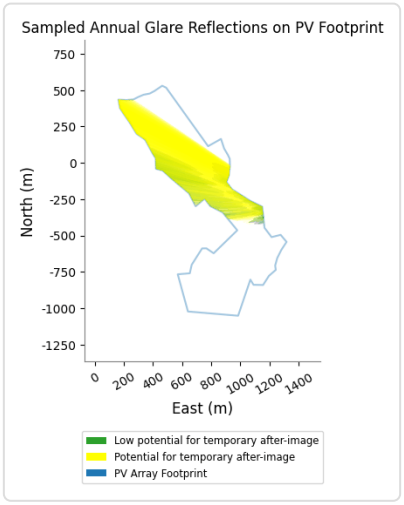
Yellow glare: 5,802 min.

Green glare: 2,539 min.





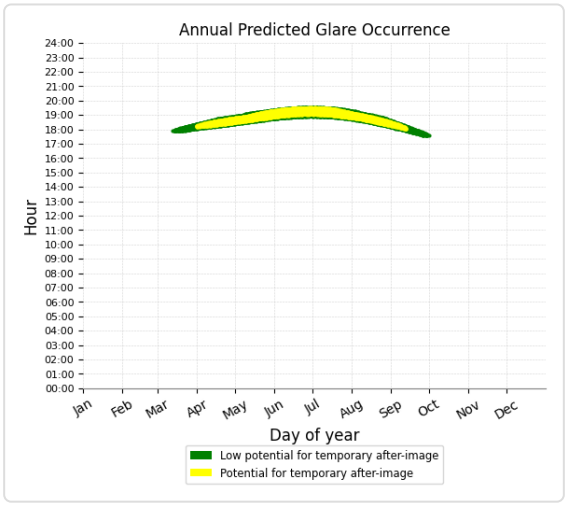


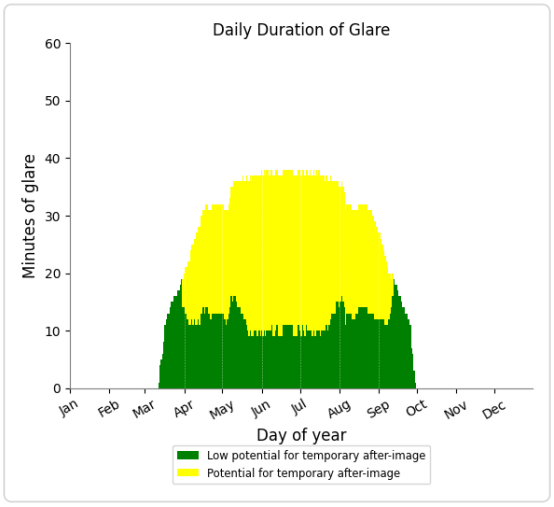


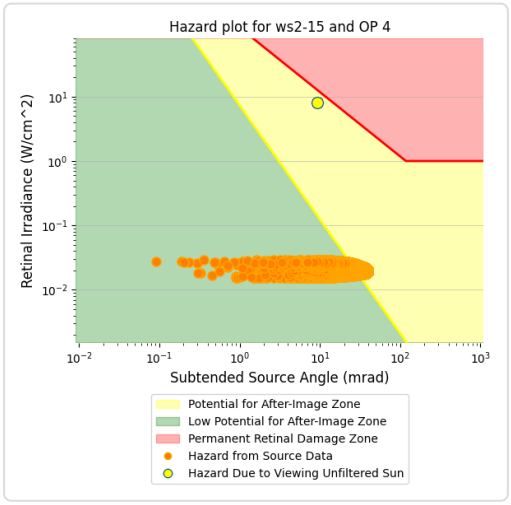
WS2 - 15 and OP 4

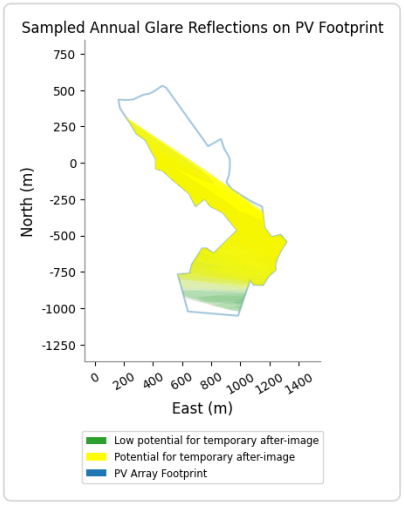
Yellow glare: 3,539 min.

Green glare: 2,416 min.





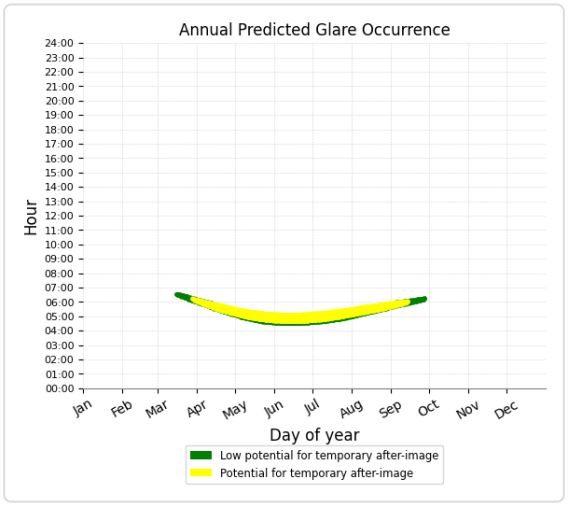


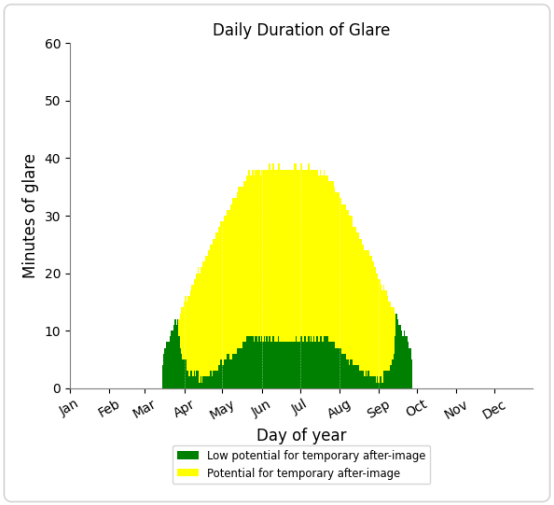


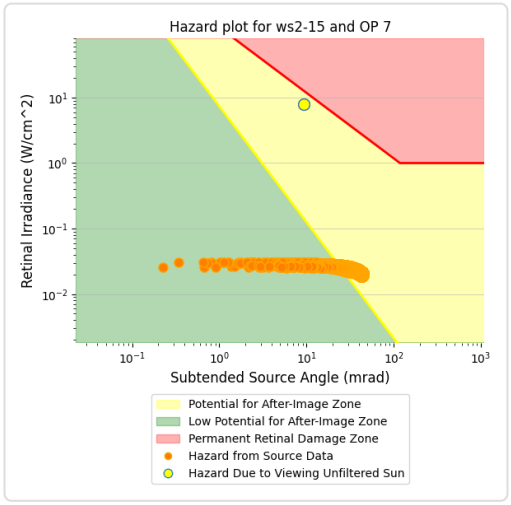
WS2 - 15 and OP 7

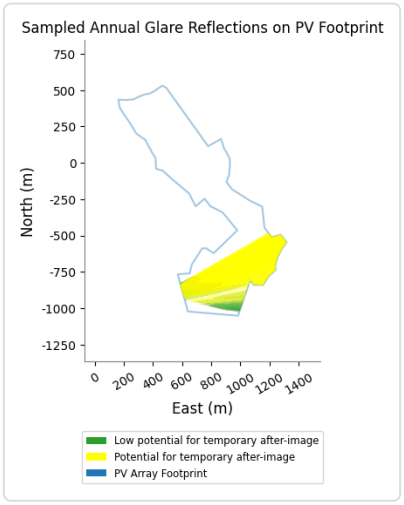
Yellow glare: 4,130 min.

Green glare: 1,239 min.





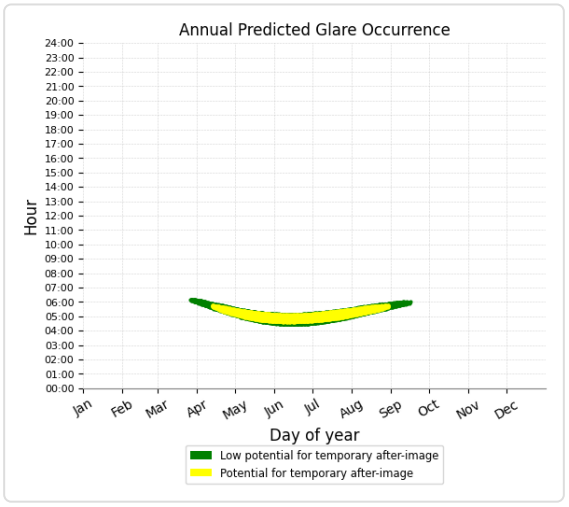


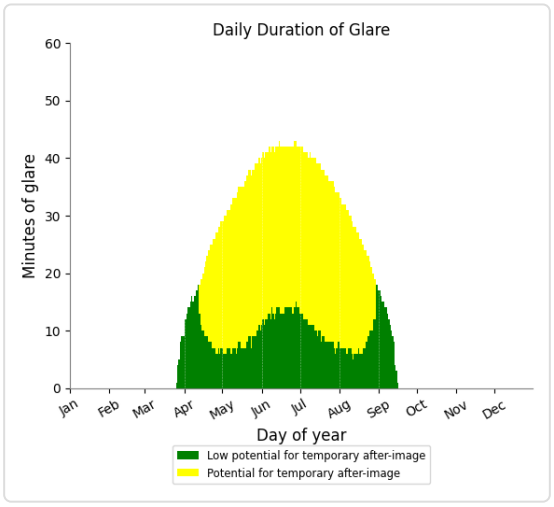


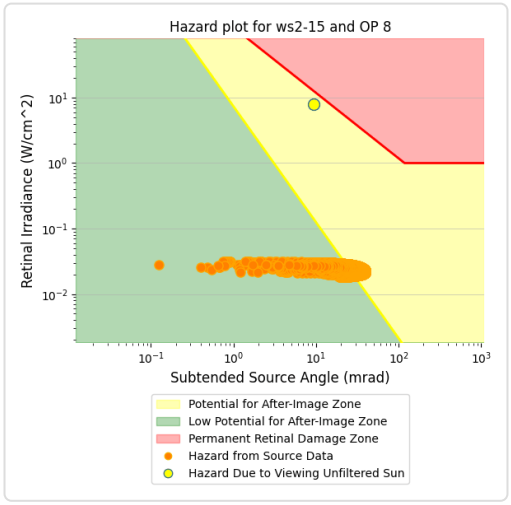
WS2 - 15 and OP 8

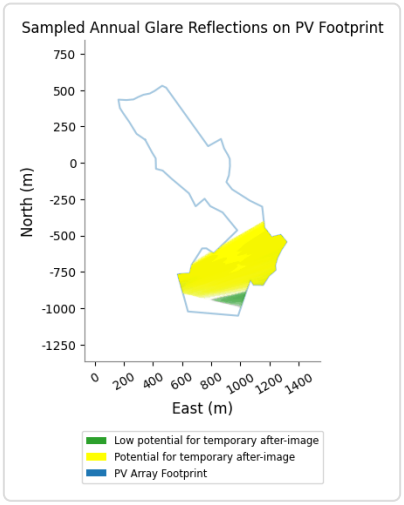
Yellow glare: 3,437 min.

Green glare: 1,727 min.





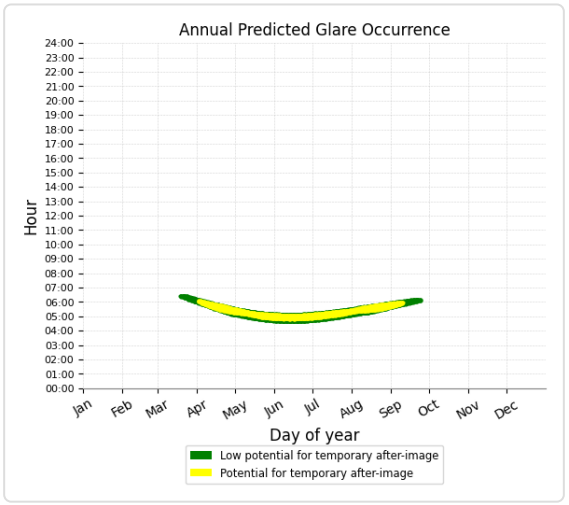


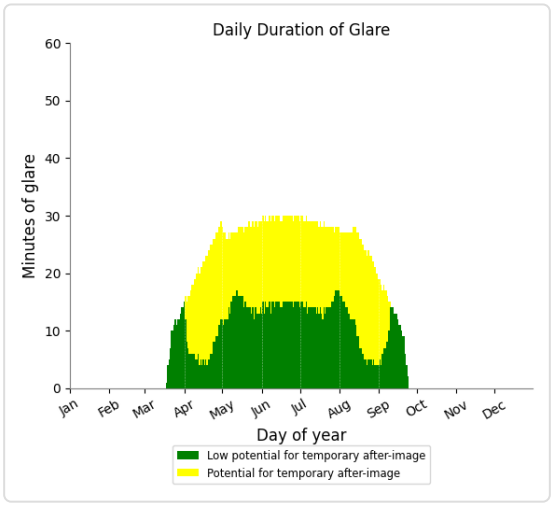


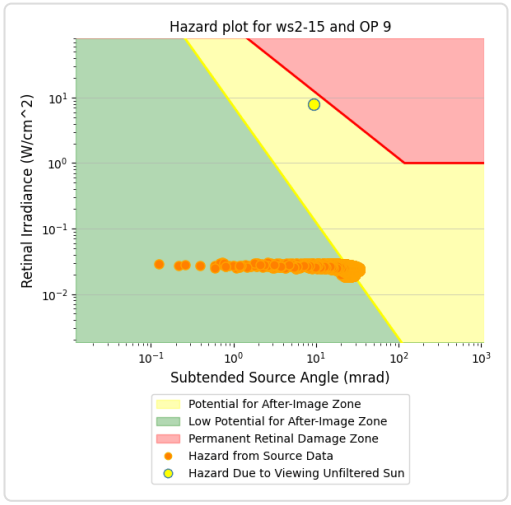
WS2 - 15 and OP 9

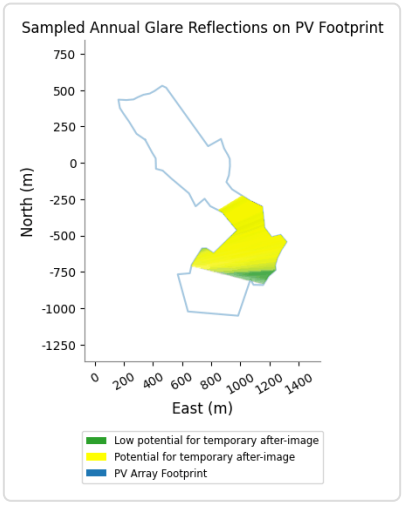
Yellow glare: 2,355 min.

Green glare: 2,164 min.





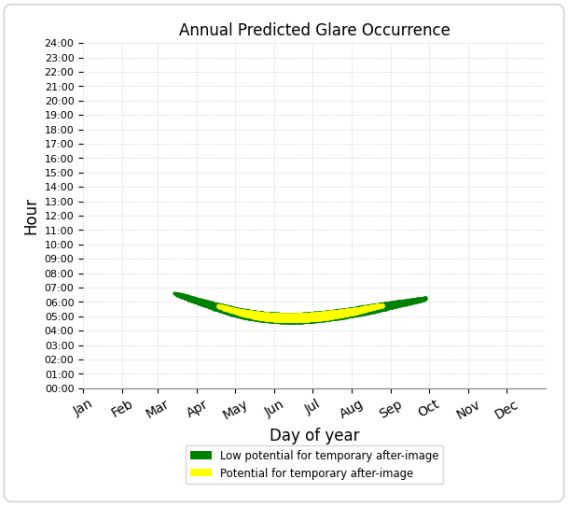


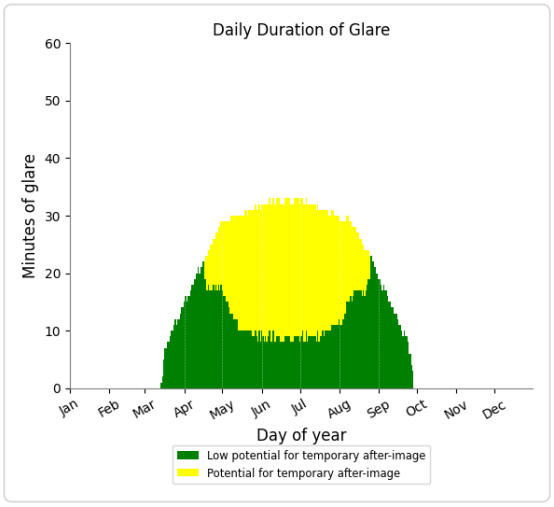


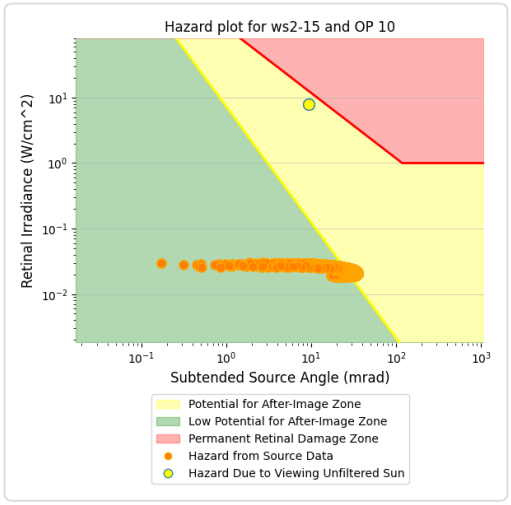
WS2 - 15 and OP 10

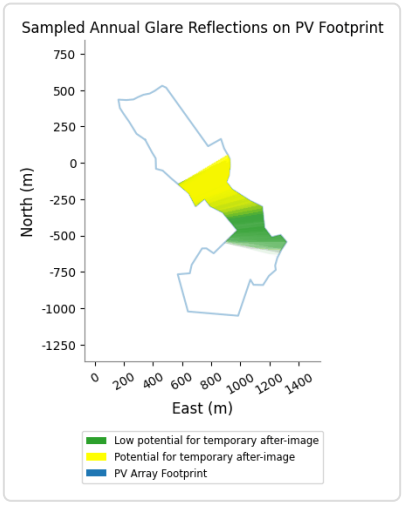
Yellow glare: 2,377 min.

Green glare: 2,477 min.





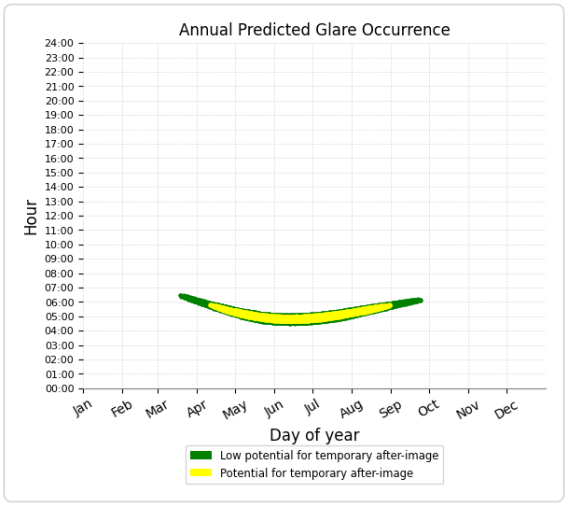


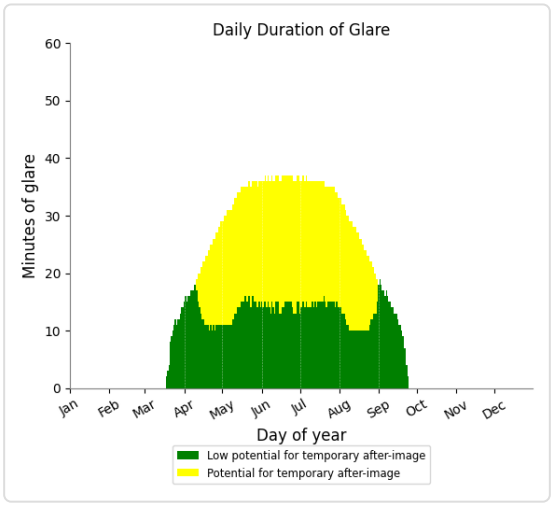


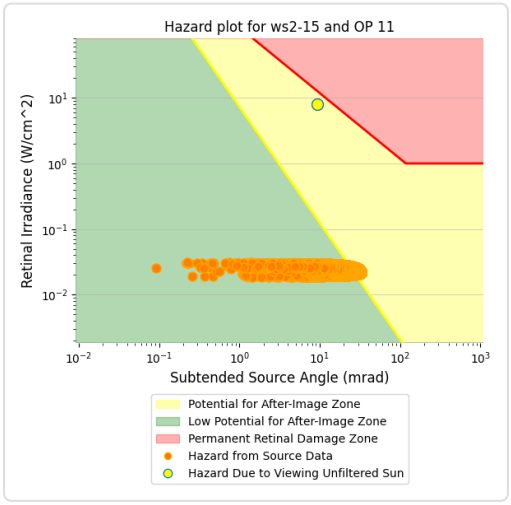
WS2 - 15 and OP 11

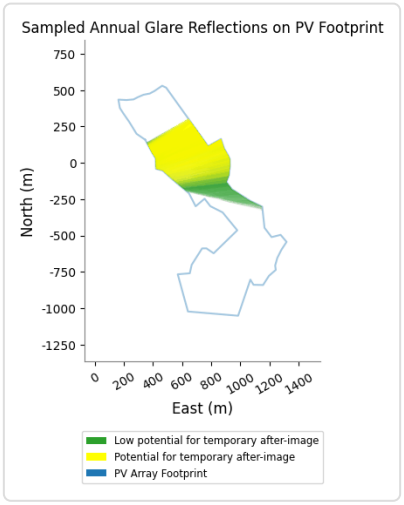
Yellow glare: 2,656 min.

Green glare: 2,492 min.





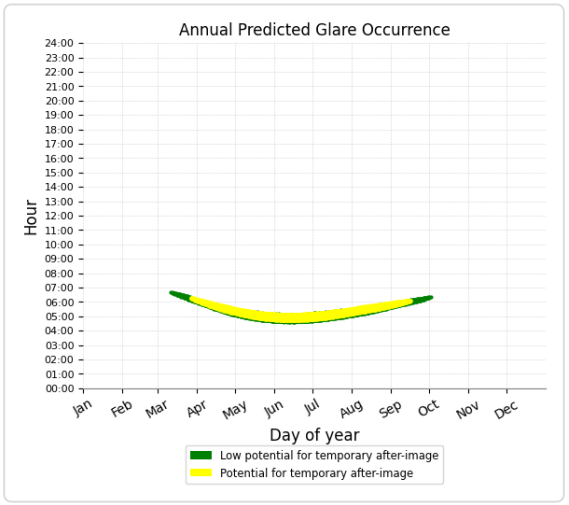


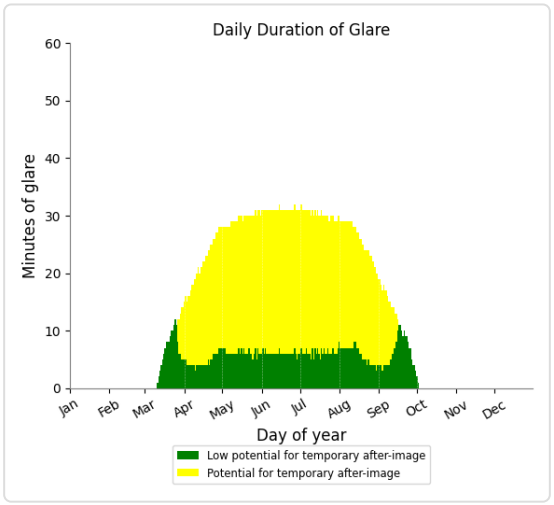


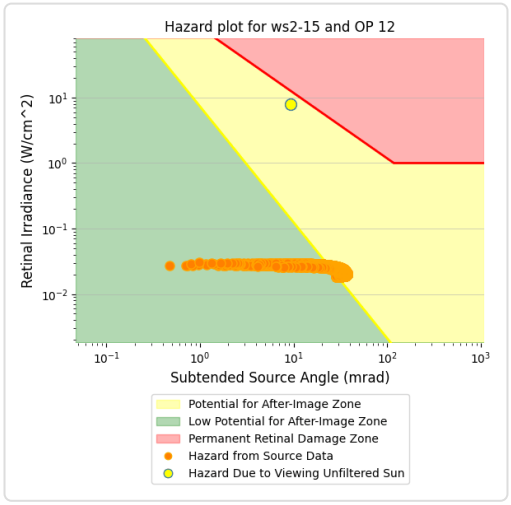
WS2 - 15 and OP 12

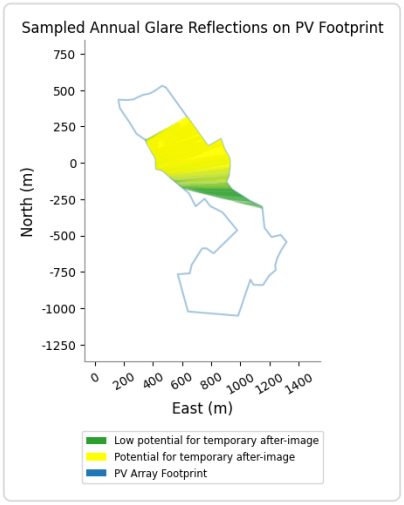
Yellow glare: 3,551 min.

Green glare: 1,231 min.





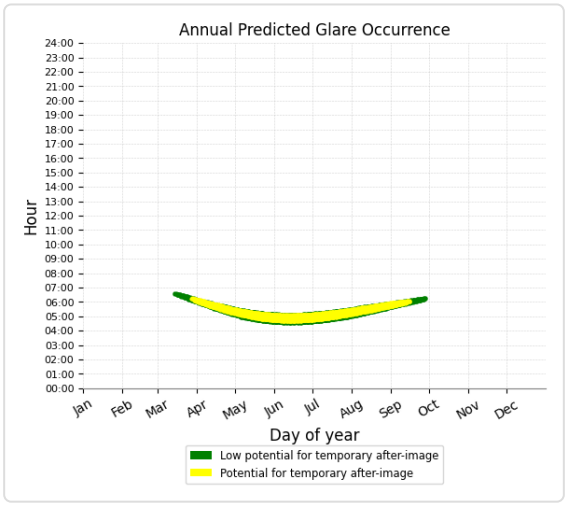


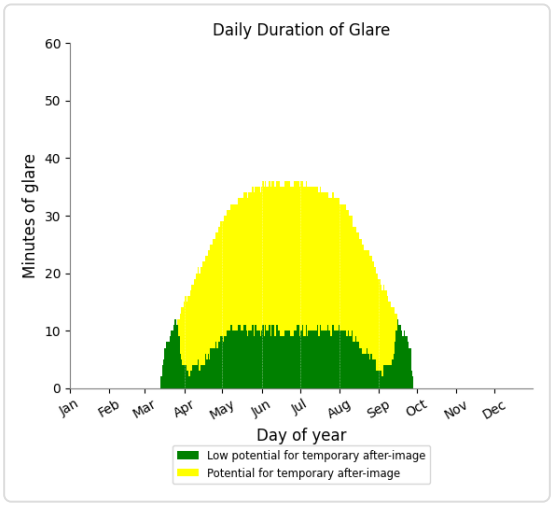


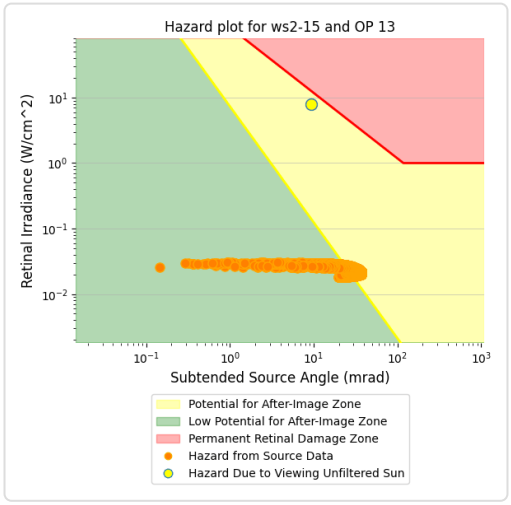
WS2 - 15 and OP 13

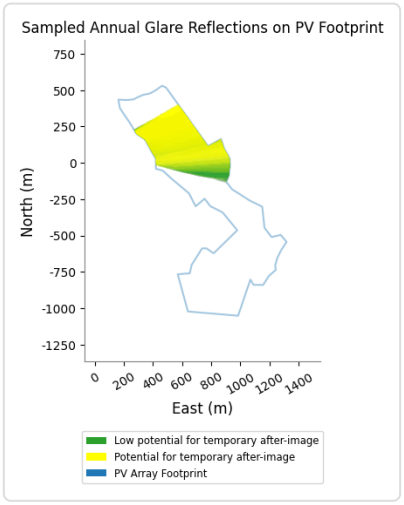
Yellow glare: 3,532 min.

Green glare: 1,616 min.





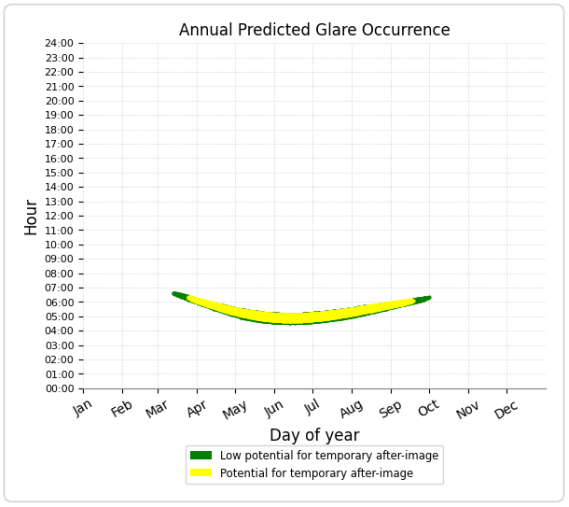


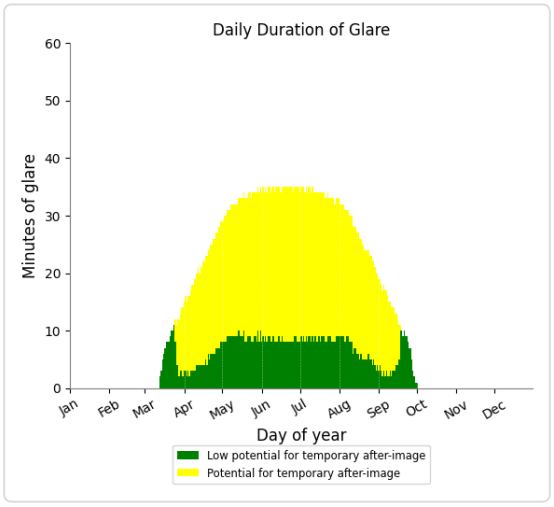


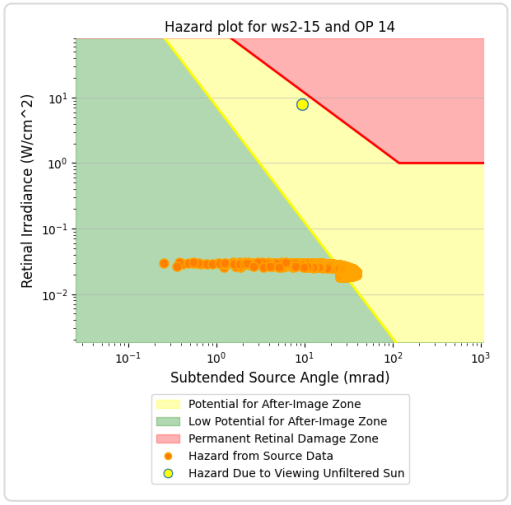
WS2 - 15 and OP 14

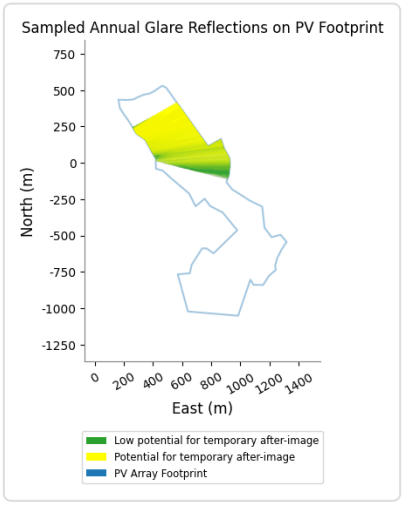
Yellow glare: 3,735 min.

Green glare: 1,376 min.





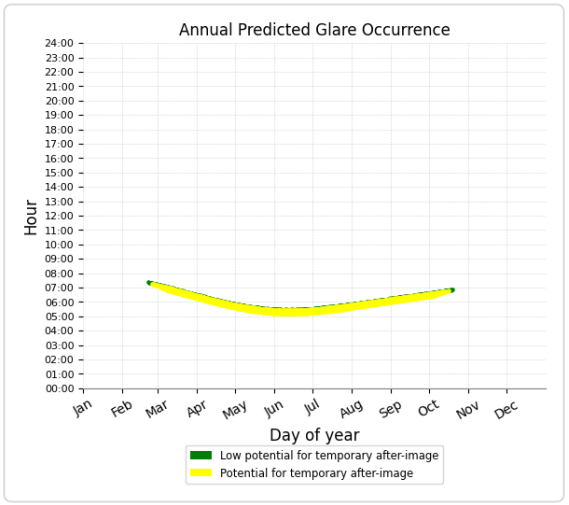


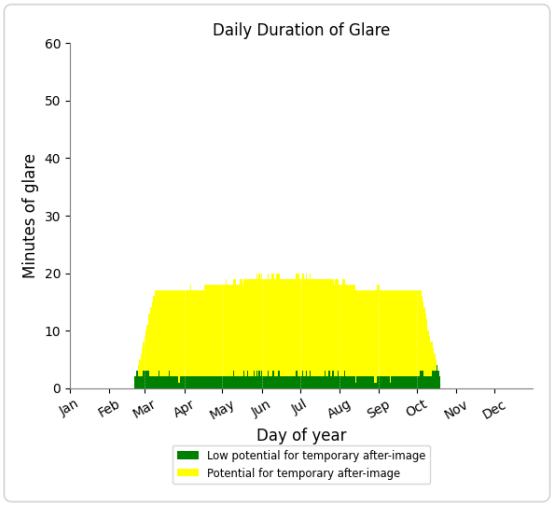


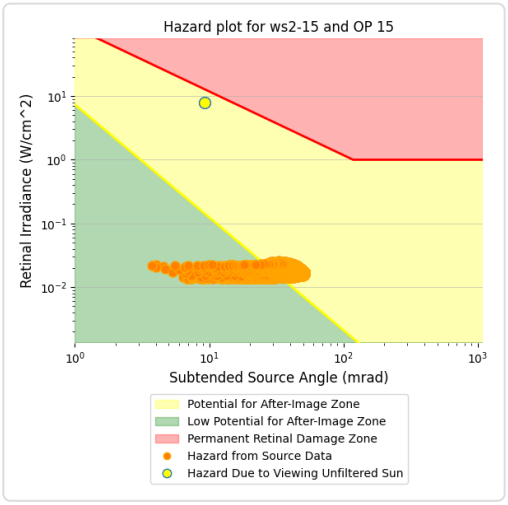
WS2 - 15 and OP 15

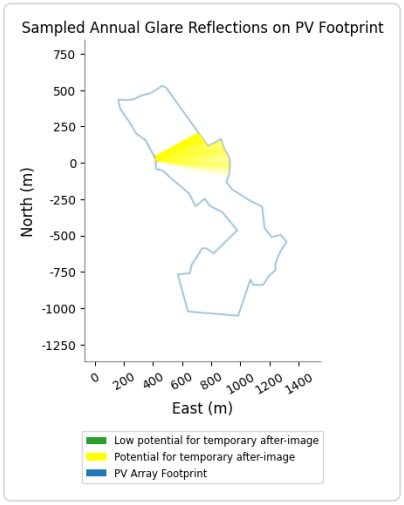
Yellow glare: 3,543 min.

Green glare: 516 min.





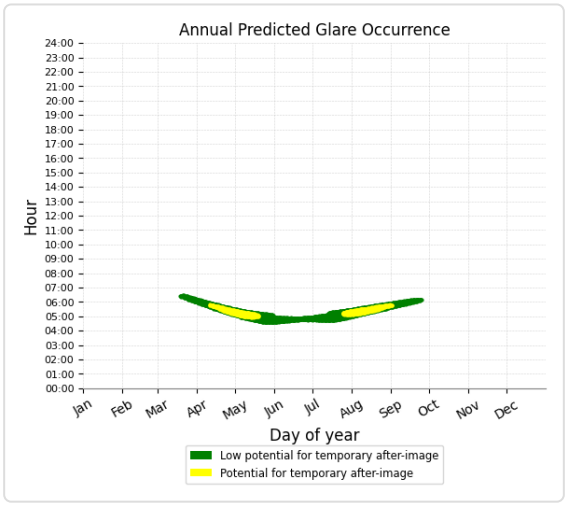


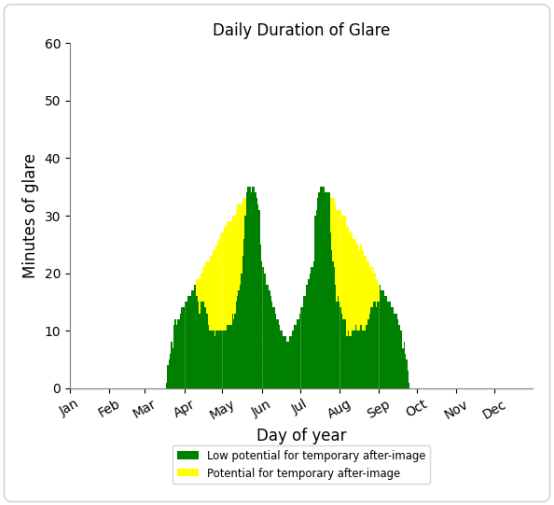


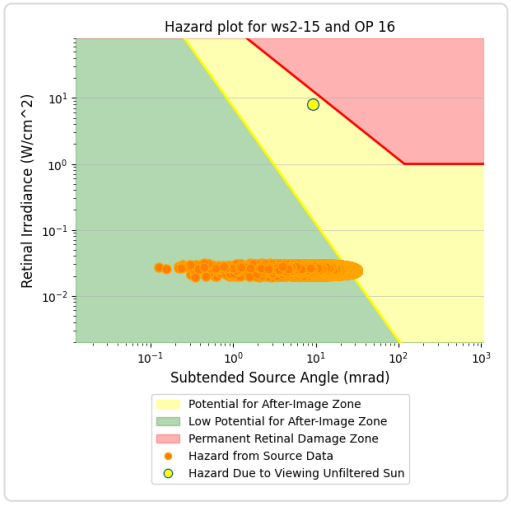
WS2 - 15 and OP 16

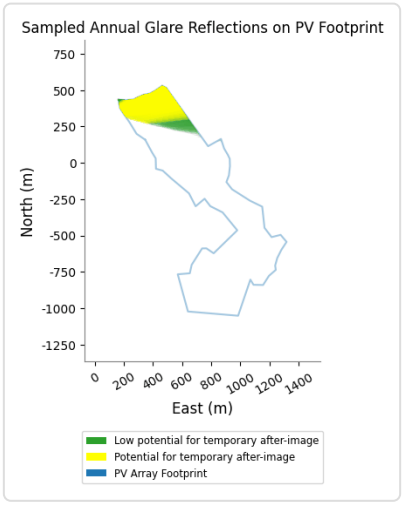
Yellow glare: 997 min.

Green glare: 3,028 min.





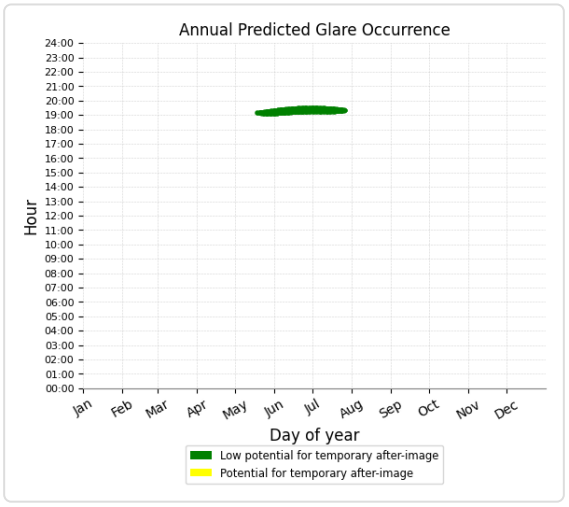


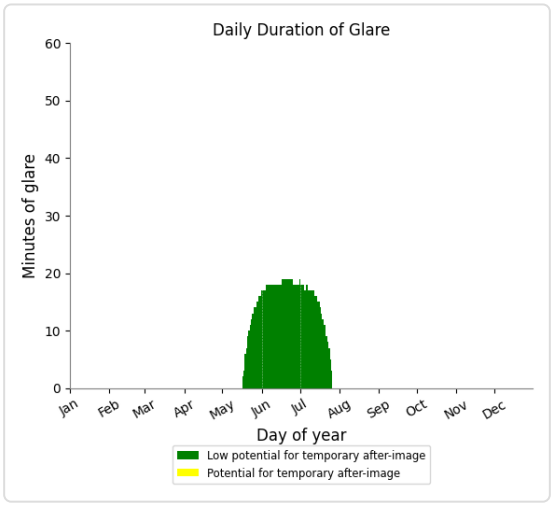


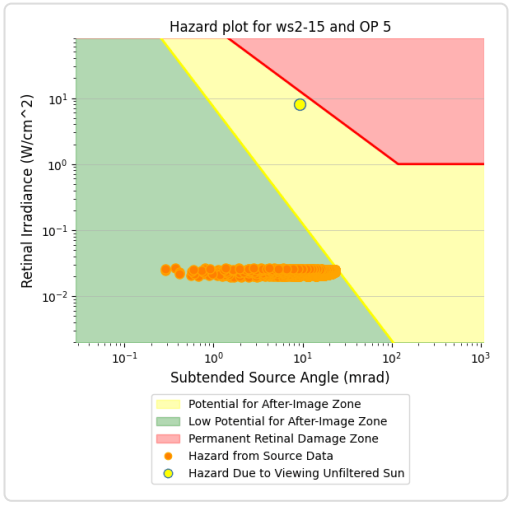
WS2 - 15 and OP 5

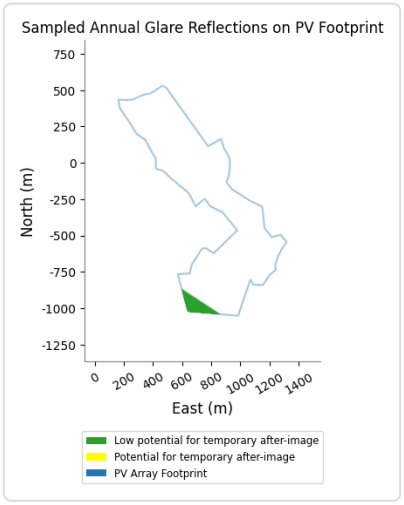
Yellow glare: none

Green glare: 1,074 min.





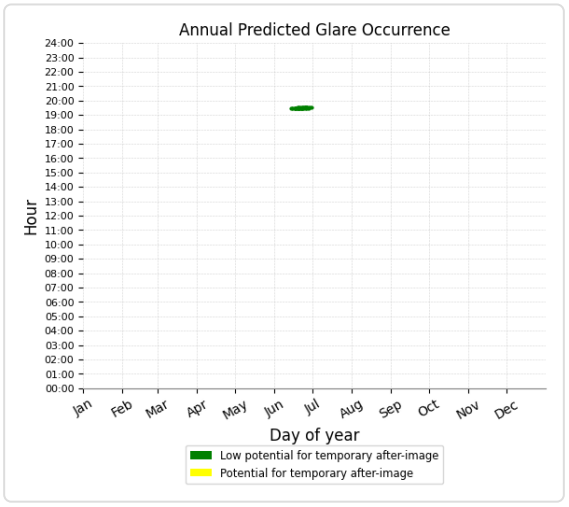


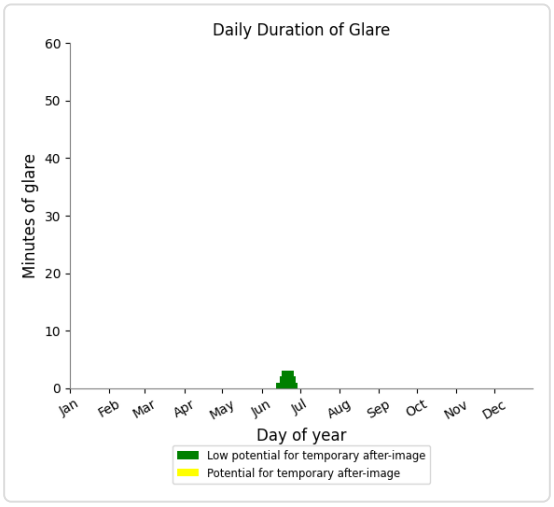


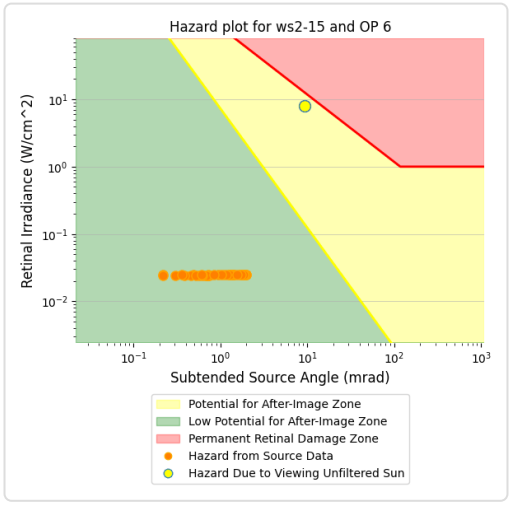
WS2 - 15 and OP 6

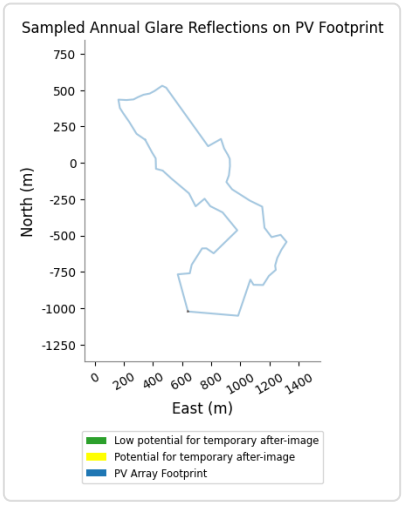
Yellow glare: none

Green glare: 39 min.









Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **JS W2B - All**

Created 03 Jul, 2025
Updated 03 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153833.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 14	25.0	180.0	133,885	2,231.4	62,477	1,041.3	-
WS2 - 15	25.0	180.0	142,727	2,378.8	103,817	1,730.3	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1B	16	0.3	0	0.0
PRoW 2B	238,623	3,977.1	90,346	1,505.8
PRoW 5B	2,082	34.7	2,763	46.0
Route 1B - Part 1	3,443	57.4	6,376	106.3
Route 1B - Part 2	827	13.8	4,143	69.0
Route 2B	369	6.2	3,531	58.9
Route 3B	1,510	25.2	8,990	149.8
Route 4B	0	0.0	0	0.0
OP 1	339	5.7	0	0.0
OP 2	1,924	32.1	1,339	22.3
OP 3	2,455	40.9	4,376	72.9
OP 4	2,912	48.5	3,241	54.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	897	14.9	3,924	65.4

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 8	1,500	25.0	3,731	62.2
OP 9	1,392	23.2	2,786	46.4
OP 10	3,305	55.1	4,718	78.6
OP 11	3,521	58.7	5,259	87.7
OP 12	2,469	41.1	6,416	106.9
OP 13	3,572	59.5	5,060	84.3
OP 14	2,031	33.9	3,703	61.7
OP 15	1,639	27.3	2,507	41.8
OP 16	1,786	29.8	3,085	51.4

Component Data

PV Arrays

Name: WS2 - 14
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.390820	-1.343497	72.03	3.80	75.83
2	53.391511	-1.340729	80.71	3.80	84.51
3	53.388529	-1.338240	90.26	3.80	94.06
4	53.388644	-1.337554	86.16	3.80	89.96
5	53.387524	-1.334785	81.36	3.80	85.16
6	53.386321	-1.336245	96.26	3.80	100.06
7	53.387268	-1.339871	92.17	3.80	95.97
8	53.387524	-1.340922	92.15	3.80	95.95
9	53.388535	-1.341802	93.88	3.80	97.68
10	53.389174	-1.342854	84.88	3.80	88.68

Name: WS2 - 15
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.392241	-1.338284	50.76	3.80	54.56
2	53.392609	-1.339175	54.21	3.80	58.01
3	53.393341	-1.339926	54.17	3.80	57.97
4	53.393888	-1.340559	51.07	3.80	54.87
5	53.394202	-1.340891	50.10	3.80	53.90
6	53.394720	-1.341047	44.90	3.80	48.70
7	53.394694	-1.340215	42.70	3.80	46.50
8	53.394733	-1.339486	40.64	3.80	44.44
9	53.394873	-1.339035	39.44	3.80	43.24
10	53.395021	-1.338466	37.45	3.80	41.25
11	53.395097	-1.337812	35.75	3.80	39.55
12	53.395257	-1.337318	34.85	3.80	38.65
13	53.395577	-1.336535	29.09	3.80	32.89
14	53.395460	-1.336123	27.80	3.80	31.60
15	53.391843	-1.331799	28.52	3.80	32.32
16	53.392291	-1.330468	30.98	3.80	34.78
17	53.391702	-1.330146	30.09	3.80	33.89
18	53.391306	-1.329760	31.71	3.80	35.51
19	53.391062	-1.329567	31.47	3.80	35.27
20	53.390615	-1.329546	30.75	3.80	34.55
21	53.390039	-1.329653	31.55	3.80	35.35
22	53.389629	-1.329910	33.32	3.80	37.12
23	53.389181	-1.329331	32.81	3.80	36.61
24	53.388478	-1.327486	32.96	3.80	36.76
25	53.388106	-1.326220	34.40	3.80	38.20
26	53.386801	-1.325984	33.46	3.80	37.26
27	53.386225	-1.325254	33.29	3.80	37.09
28	53.386366	-1.324321	34.02	3.80	37.82
29	53.385931	-1.323709	36.02	3.80	39.82
30	53.385442	-1.324242	39.14	3.80	42.94
31	53.384930	-1.324671	42.51	3.80	46.31
32	53.384470	-1.324886	44.31	3.80	48.11
33	53.384201	-1.324822	45.22	3.80	49.02
34	53.383830	-1.325530	47.87	3.80	51.67
35	53.383267	-1.326130	49.34	3.80	53.14
36	53.383280	-1.327117	50.76	3.80	54.56
37	53.383599	-1.327439	52.75	3.80	56.55
38	53.381366	-1.328705	62.09	3.80	65.89
39	53.381629	-1.333877	73.79	3.80	77.59
40	53.383926	-1.334928	74.97	3.80	78.77
41	53.383990	-1.333684	72.36	3.80	76.16
42	53.384515	-1.333490	83.23	3.80	87.03
43	53.385526	-1.332418	86.45	3.80	90.25
44	53.385532	-1.331978	79.42	3.80	83.22
45	53.385225	-1.331227	73.25	3.80	77.05
46	53.386646	-1.328791	41.73	3.80	45.53
47	53.387753	-1.330304	40.65	3.80	44.45
48	53.388137	-1.331570	45.95	3.80	49.75
49	53.388597	-1.332160	45.59	3.80	49.39
50	53.388130	-1.333083	56.17	3.80	59.97
51	53.388930	-1.333769	48.52	3.80	52.32
52	53.389839	-1.335572	49.51	3.80	53.31
53	53.390334	-1.336478	51.76	3.80	55.56
54	53.390446	-1.337170	54.06	3.80	57.86
55	53.391089	-1.337203	51.01	3.80	54.81
56	53.391456	-1.337576	51.06	3.80	54.86

Route Receptors

Name: PRoW 1B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.396225	-1.324512	72.13	2.50	74.63
2	53.396958	-1.327462	61.99	2.50	64.49
3	53.396906	-1.327977	60.93	2.50	63.43
4	53.398656	-1.331470	44.22	2.50	46.72
5	53.397792	-1.332929	39.70	2.50	42.20
6	53.396897	-1.334742	30.00	2.50	32.50

Name: PRoW 2B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.394815	-1.324646	65.57	2.50	68.07
2	53.393829	-1.326920	52.56	2.50	55.06
3	53.392755	-1.329409	37.76	2.50	40.26
4	53.391789	-1.331856	28.56	2.50	31.06
5	53.391492	-1.334830	39.53	2.50	42.03
6	53.390689	-1.337469	54.87	2.50	57.37
7	53.390808	-1.338658	64.92	2.50	67.42
8	53.390458	-1.339277	73.11	2.50	75.61
9	53.390781	-1.340122	80.05	2.50	82.55
10	53.391526	-1.340852	81.00	2.50	83.50
11	53.390794	-1.343668	70.14	2.50	72.64
12	53.390608	-1.345186	55.66	2.50	58.16
13	53.390778	-1.345455	52.40	2.50	54.90

Name: PRoW 5B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.389201	-1.349242	34.97	2.50	37.47
2	53.390845	-1.350315	31.67	2.50	34.17
3	53.392477	-1.351645	28.35	2.50	30.85
4	53.392509	-1.348952	31.73	2.50	34.23
5	53.393814	-1.347965	32.08	2.50	34.58
6	53.395528	-1.347086	28.79	2.50	31.29

Name: Route 1B - Part 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395594	-1.336708	29.84	1.50	31.34
2	53.394904	-1.339143	39.12	1.50	40.62
3	53.394846	-1.342244	47.47	1.50	48.97
4	53.394961	-1.344250	50.63	1.50	52.13
5	53.393822	-1.345195	56.73	1.50	58.23
6	53.392005	-1.345044	58.08	1.50	59.58
7	53.390828	-1.345259	53.45	1.50	54.95
8	53.389843	-1.347598	42.80	1.50	44.30
9	53.388614	-1.349829	36.46	1.50	37.96
10	53.386938	-1.350841	46.58	1.50	48.08

Name: Route 1B - Part 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382913	-1.343803	58.20	1.50	59.70
2	53.382394	-1.340971	71.56	1.50	73.06
3	53.381933	-1.337967	78.88	1.50	80.38
4	53.380653	-1.335799	83.81	1.50	85.31
5	53.379847	-1.334576	89.22	1.50	90.72
6	53.379489	-1.331680	84.08	1.50	85.58
7	53.379054	-1.328697	84.66	1.50	86.16
8	53.378529	-1.325779	77.32	1.50	78.82
9	53.377786	-1.323440	79.08	1.50	80.58
10	53.377057	-1.320736	79.96	1.50	81.46
11	53.376948	-1.318430	77.73	1.50	79.23

Name: Route 2B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.396256	-1.324407	72.45	1.50	73.95
2	53.394478	-1.324428	62.88	1.50	64.38
3	53.392661	-1.324407	58.75	1.50	60.25
4	53.390856	-1.323977	62.50	1.50	64.00
5	53.389052	-1.323420	55.97	1.50	57.47
6	53.387299	-1.322883	48.50	1.50	50.00
7	53.385546	-1.322411	40.57	1.50	42.07
8	53.383728	-1.322025	47.67	1.50	49.17
9	53.382020	-1.321081	57.39	1.50	58.89
10	53.380407	-1.319664	66.22	1.50	67.72
11	53.378635	-1.319292	73.30	1.50	74.80
12	53.376842	-1.318905	79.80	1.50	81.30
13	53.375102	-1.318519	84.48	1.50	85.98

Name: Route 3B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.386116	-1.322498	43.37	1.50	44.87
2	53.384920	-1.320310	49.69	1.50	51.19
3	53.384337	-1.318411	55.66	1.50	57.16
4	53.384670	-1.316447	54.04	1.50	55.54
5	53.383973	-1.315224	56.16	1.50	57.66
6	53.383269	-1.315857	57.41	1.50	58.91
7	53.382098	-1.315364	57.59	1.50	59.09
8	53.381566	-1.313797	61.45	1.50	62.95
9	53.381477	-1.310729	78.40	1.50	79.90
10	53.381477	-1.308530	93.29	1.50	94.79

Name: Route 4B
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395735	-1.354576	34.41	2.75	37.16
2	53.393943	-1.354576	27.80	2.75	30.55
3	53.392152	-1.354876	33.49	2.75	36.24
4	53.390437	-1.355155	32.81	2.75	35.56
5	53.388582	-1.355477	34.62	2.75	37.37
6	53.386803	-1.355799	35.86	2.75	38.61
7	53.385613	-1.355799	36.44	2.75	39.19

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.395723	-1.323251	75.69	2.00
OP 2	2	53.393443	-1.326161	53.66	2.00
OP 3	3	53.388065	-1.322144	59.41	2.00
OP 4	4	53.382396	-1.310768	85.66	2.00
OP 5	5	53.376743	-1.318369	78.10	2.00
OP 6	6	53.377135	-1.322285	80.00	2.00
OP 7	7	53.381836	-1.338481	77.23	2.00
OP 8	8	53.381318	-1.341784	62.25	2.00
OP 9	9	53.383436	-1.342621	59.05	2.00
OP 10	10	53.385789	-1.344533	56.59	2.00
OP 11	11	53.388101	-1.347958	41.32	2.00
OP 12	12	53.389273	-1.345874	56.98	2.00
OP 13	13	53.390173	-1.346228	50.39	2.00
OP 14	14	53.390601	-1.345689	51.81	2.00
OP 15	15	53.391019	-1.337957	58.00	2.00
OP 16	16	53.392306	-1.348503	34.63	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 14	25.0	180.0	133,885	2,231.4	62,477	1,041.3	-
WS2 - 15	25.0	180.0	142,727	2,378.8	103,817	1,730.3	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1B	16	0.3	0	0.0
PRoW 2B	238,623	3,977.1	90,346	1,505.8
PRoW 5B	2,082	34.7	2,763	46.0
Route 1B - Part 1	3,443	57.4	6,376	106.3
Route 1B - Part 2	827	13.8	4,143	69.0
Route 2B	369	6.2	3,531	58.9
Route 3B	1,510	25.2	8,990	149.8
Route 4B	0	0.0	0	0.0
OP 1	339	5.7	0	0.0
OP 2	1,924	32.1	1,339	22.3
OP 3	2,455	40.9	4,376	72.9
OP 4	2,912	48.5	3,241	54.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	897	14.9	3,924	65.4
OP 8	1,500	25.0	3,731	62.2
OP 9	1,392	23.2	2,786	46.4
OP 10	3,305	55.1	4,718	78.6
OP 11	3,521	58.7	5,259	87.7
OP 12	2,469	41.1	6,416	106.9
OP 13	3,572	59.5	5,060	84.3
OP 14	2,031	33.9	3,703	61.7
OP 15	1,639	27.3	2,507	41.8
OP 16	1,786	29.8	3,085	51.4

PV: WS2 - 14 potential temporary after-image

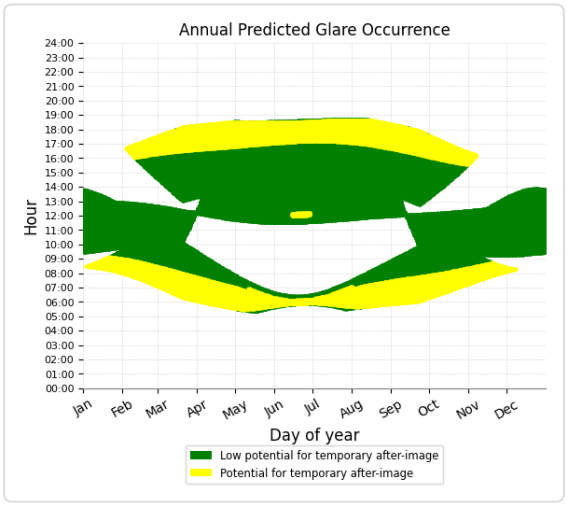
Receptor results ordered by category of glare

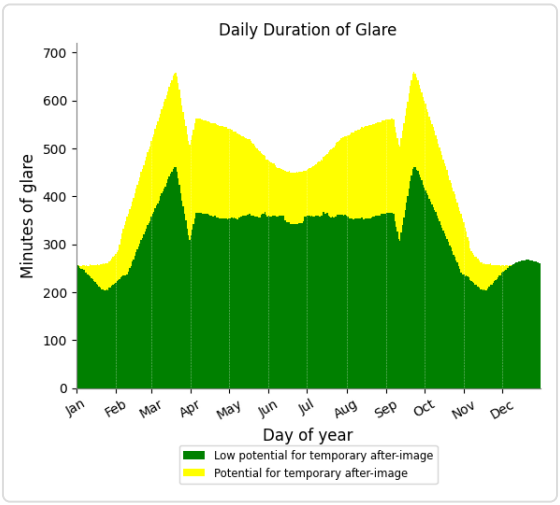
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2B	118,190	1,969.8	45,913	765.2
Route 1B - Part 1	2,513	41.9	2,167	36.1
Route 2B	299	5.0	1,091	18.2
Route 3B	1,032	17.2	2,636	43.9
PRoW 1B	0	0.0	0	0.0
PRoW 5B	0	0.0	0	0.0
Route 1B - Part 2	0	0.0	0	0.0
Route 4B	0	0.0	0	0.0
OP 3	800	13.3	21	0.3
OP 4	931	15.5	342	5.7
OP 10	1,734	28.9	2,422	40.4
OP 11	1,747	29.1	2,420	40.3
OP 12	1,657	27.6	3,258	54.3
OP 13	2,550	42.5	1,826	30.4
OP 14	1,163	19.4	381	6.3
OP 15	1,269	21.1	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 16	0	0.0	0	0.0

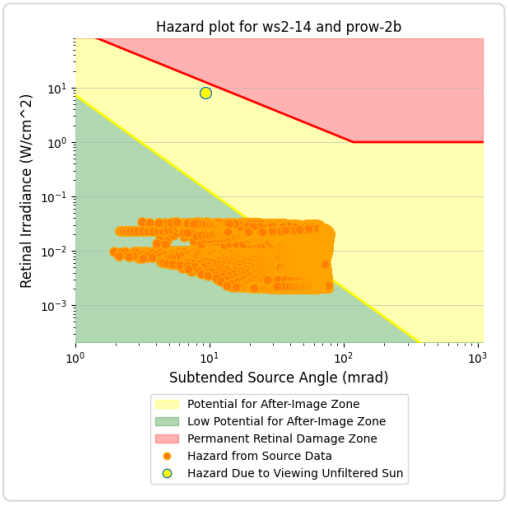
WS2 - 14 and Route: PRoW 2B

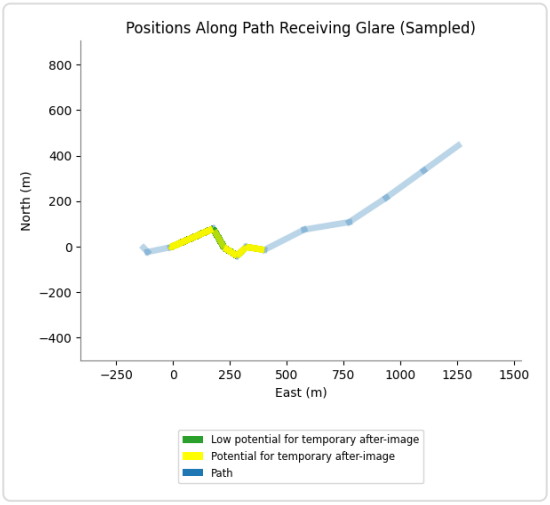
Yellow glare: 45,913 min.

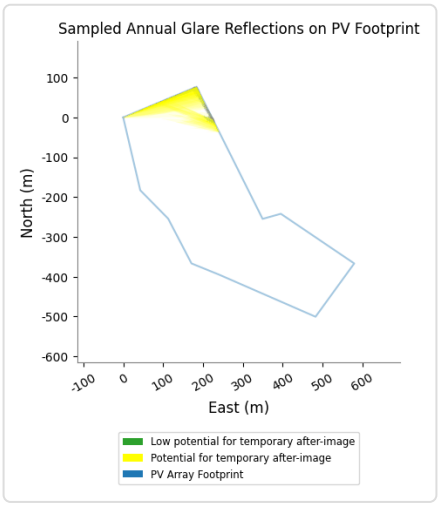
Green glare: 118,190 min.







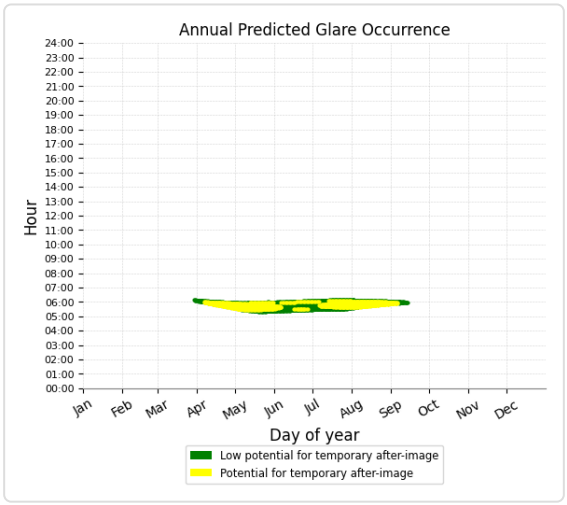


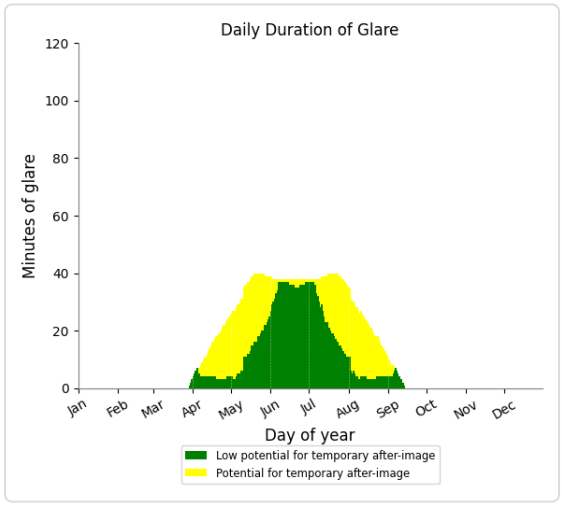


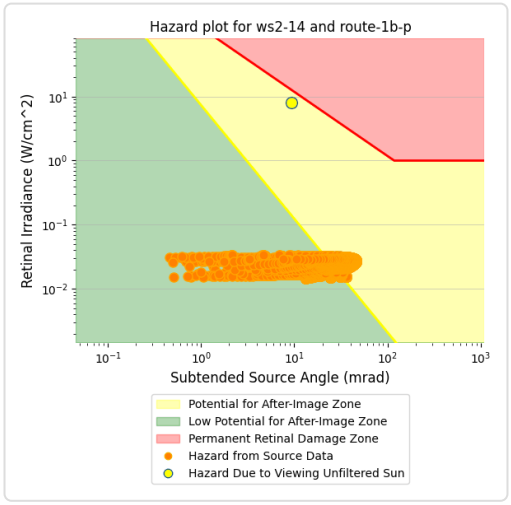
WS2 - 14 and Route: Route 1B - Part 1

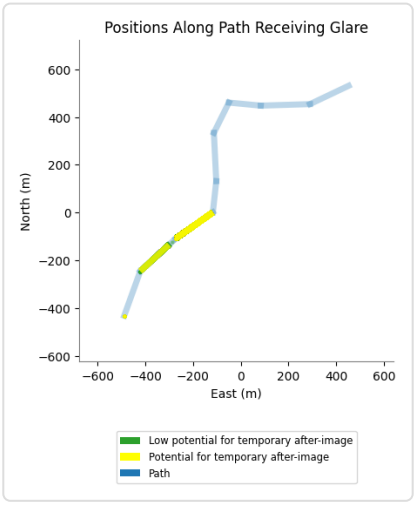
Yellow glare: 2,167 min.

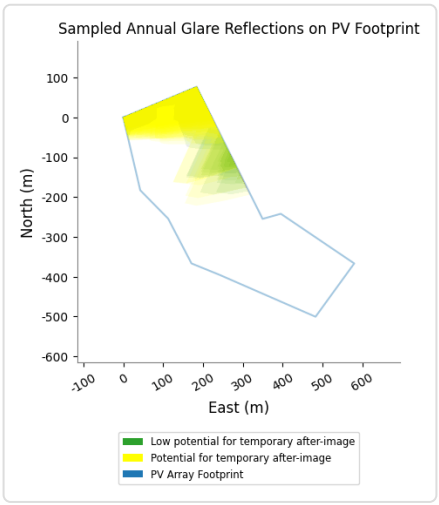
Green glare: 2,513 min.







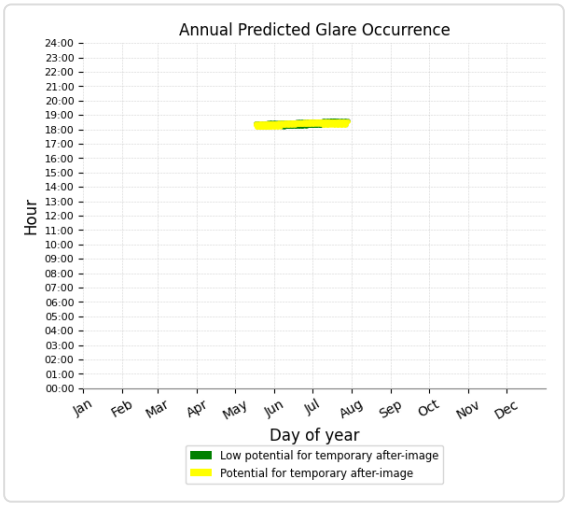


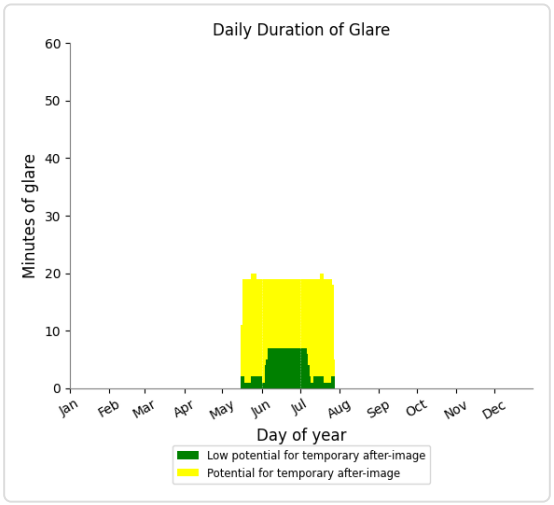


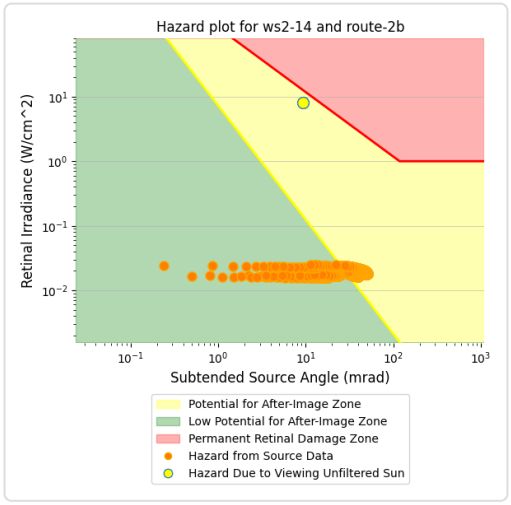
WS2 - 14 and Route: Route 2B

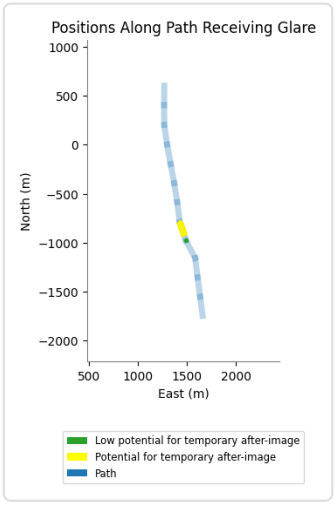
Yellow glare: 1,091 min.

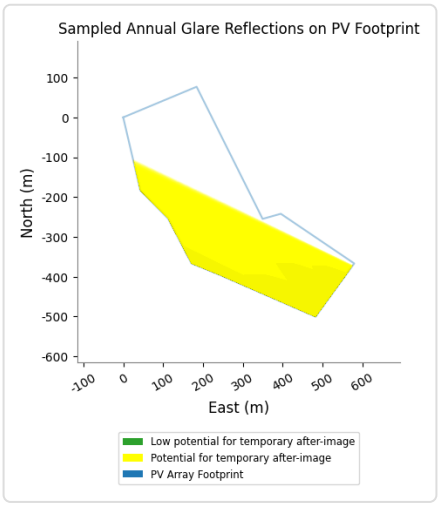
Green glare: 299 min.







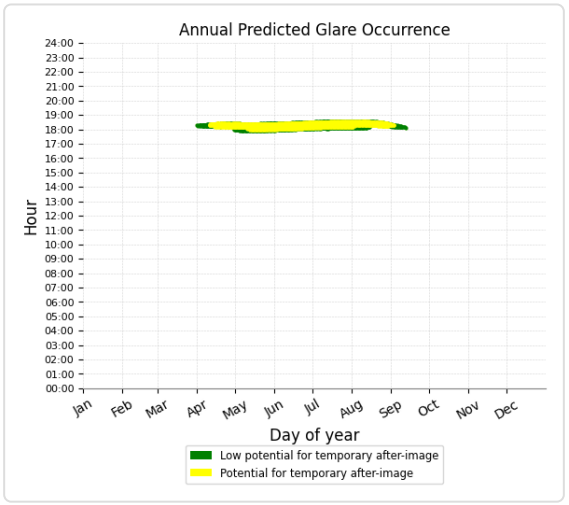


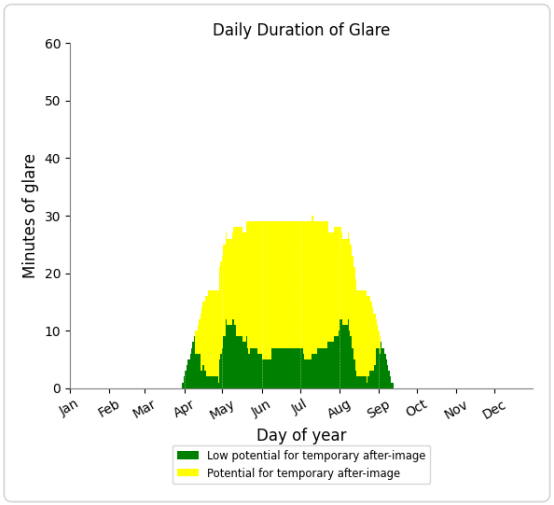


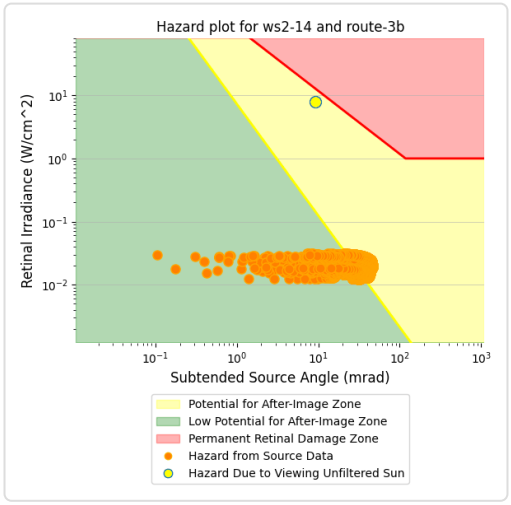
WS2 - 14 and Route: Route 3B

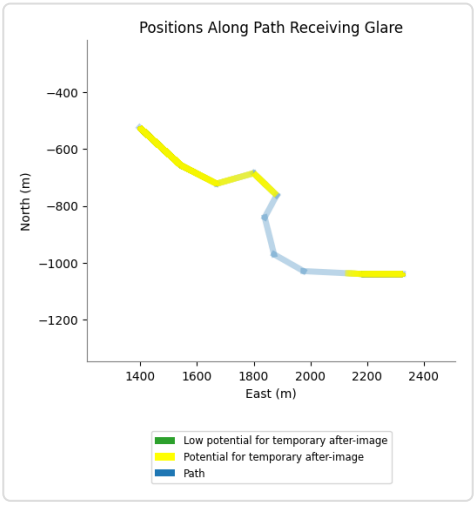
Yellow glare: 2,636 min.

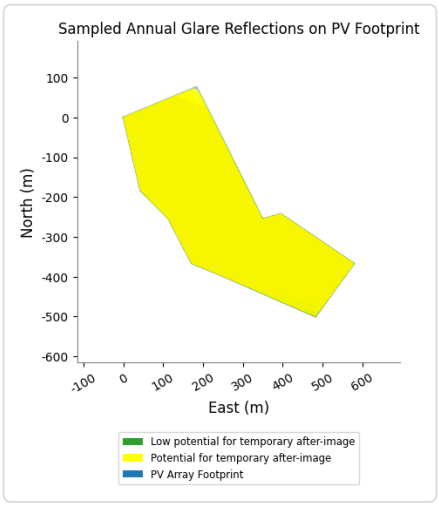
Green glare: 1,032 min.











WS2 - 14 and Route: PRoW 1B

No glare found

WS2 - 14 and Route: PRoW 5B

No glare found

WS2 - 14 and Route: Route 1B - Part 2

No glare found

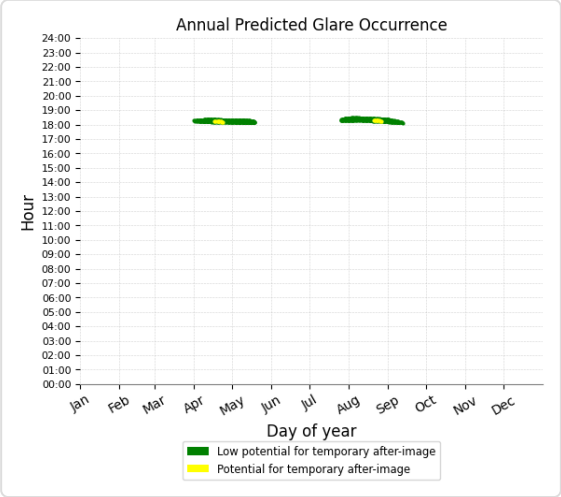
WS2 - 14 and Route: Route 4B

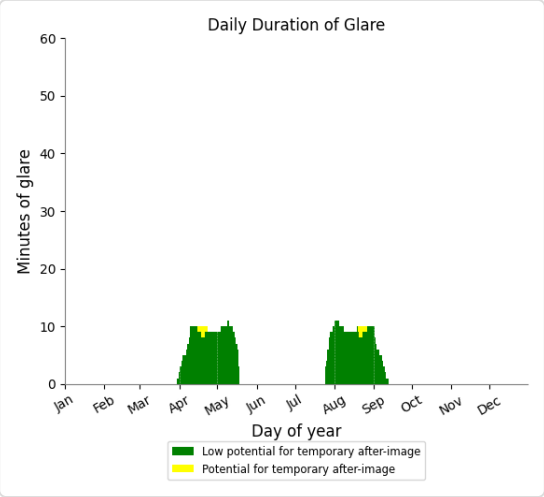
No glare found

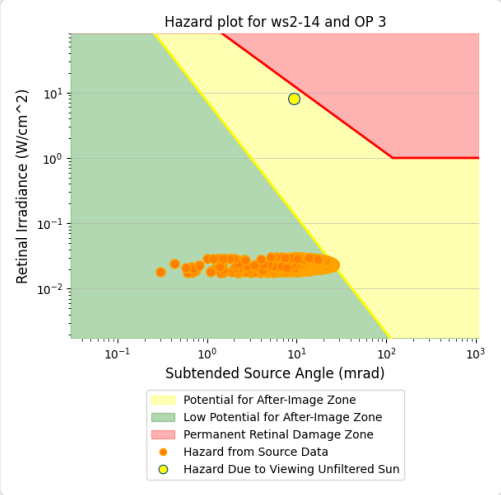
WS2 - 14 and OP 3

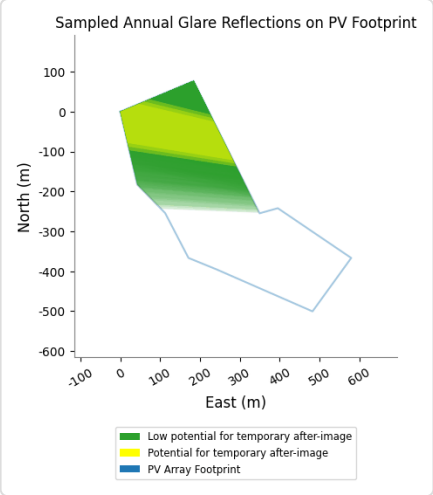
Yellow glare: 21 min.

Green glare: 800 min.





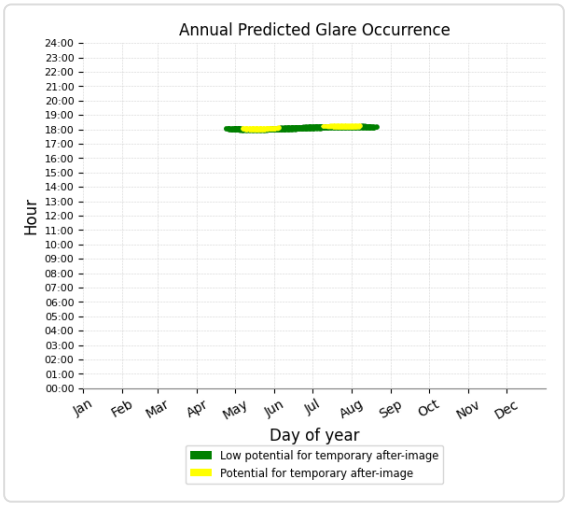


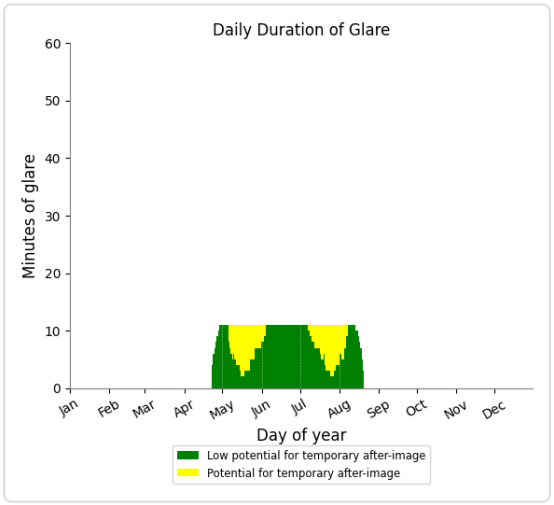


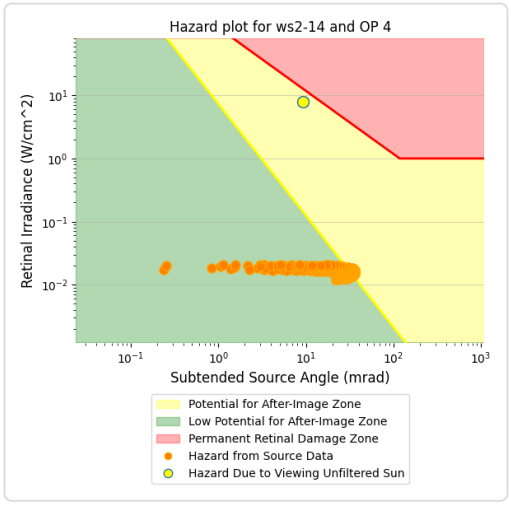
WS2 - 14 and OP 4

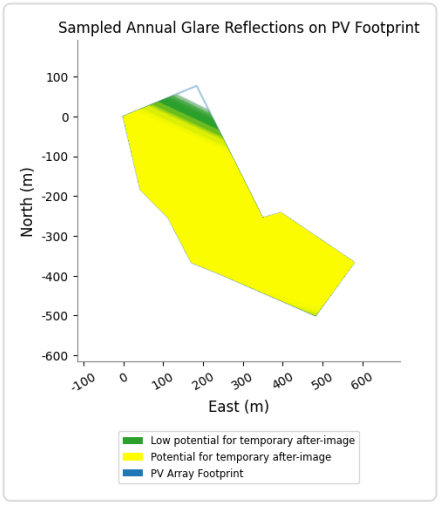
Yellow glare: 342 min.

Green glare: 931 min.





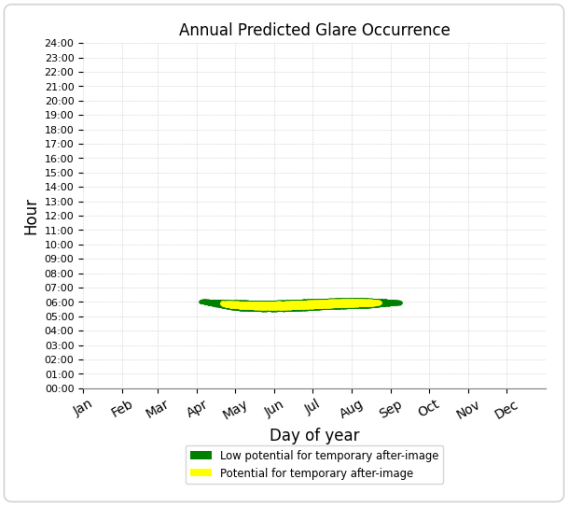


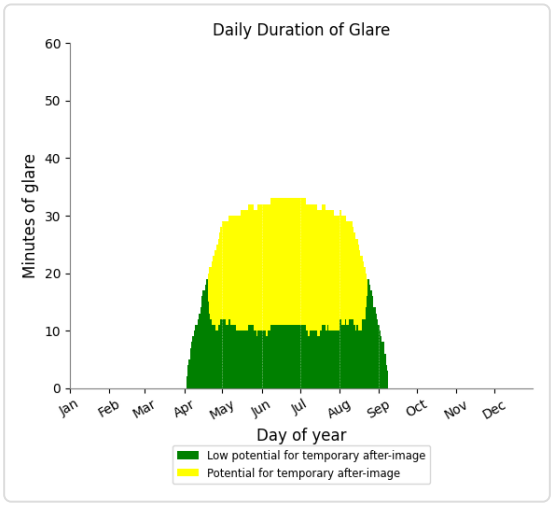


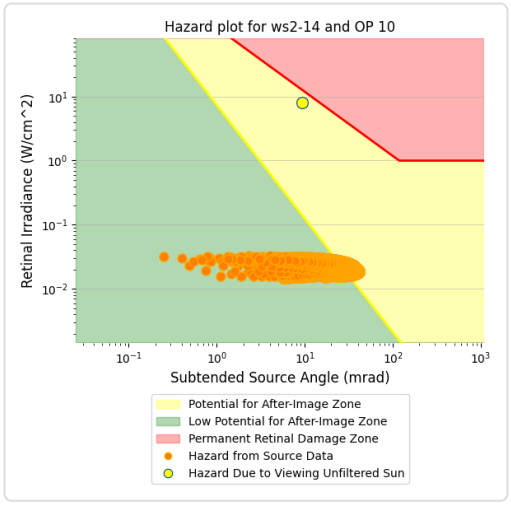
WS2 - 14 and OP 10

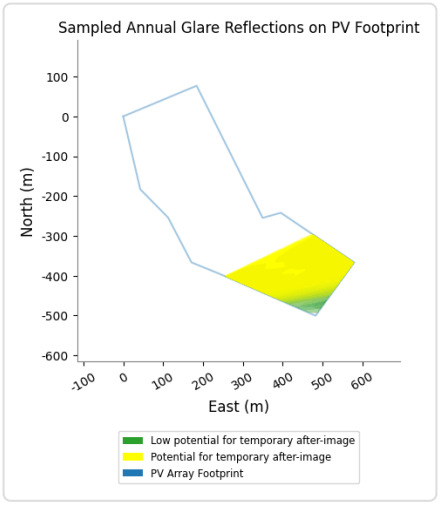
Yellow glare: 2,422 min.

Green glare: 1,734 min.





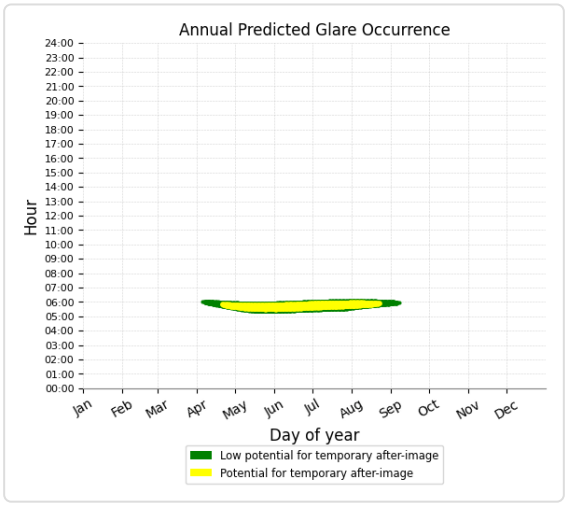


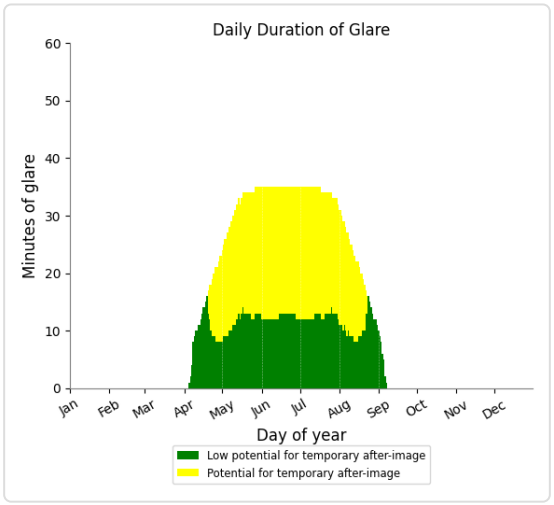


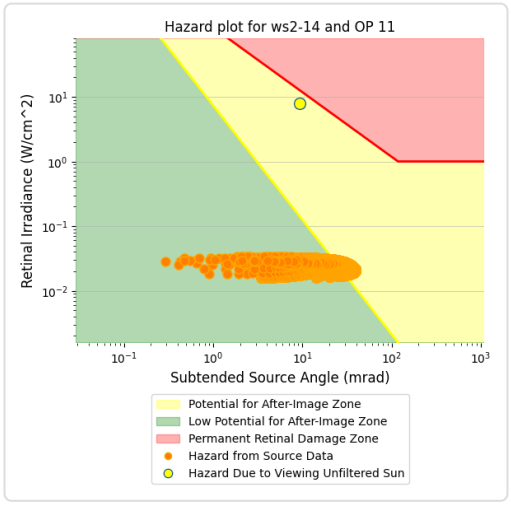
WS2 - 14 and OP 11

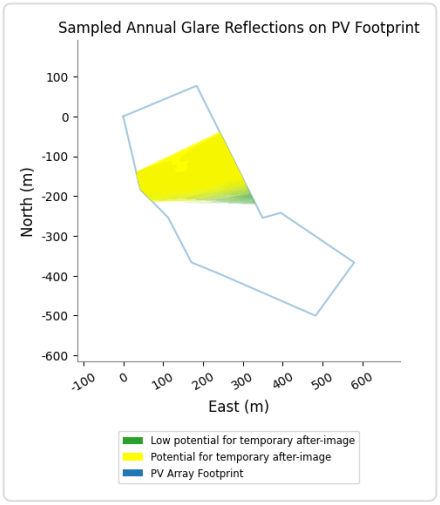
Yellow glare: 2,420 min.

Green glare: 1,747 min.





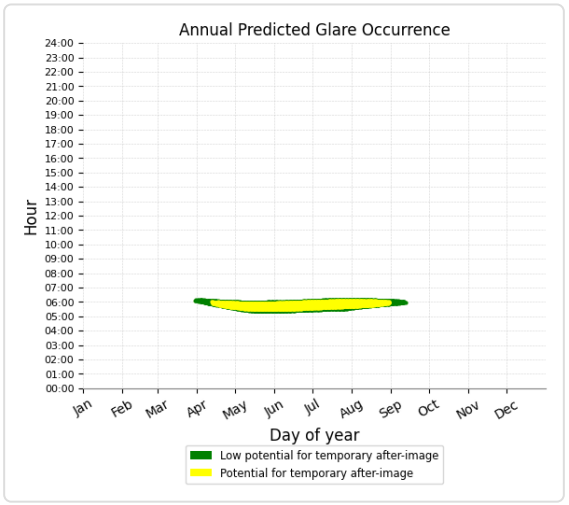


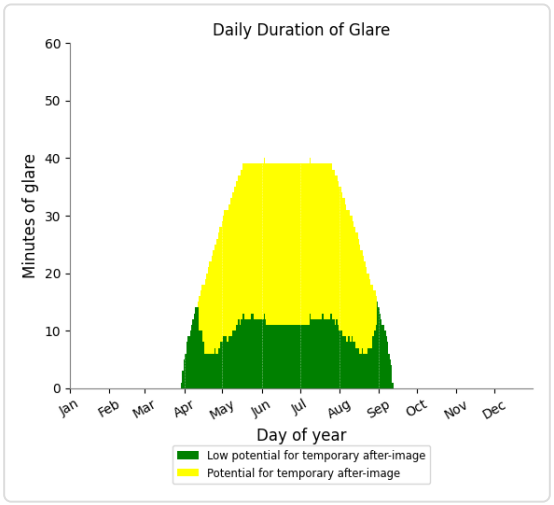


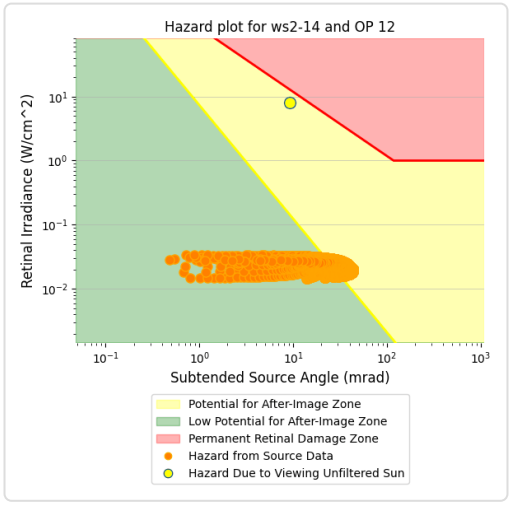
WS2 - 14 and OP 12

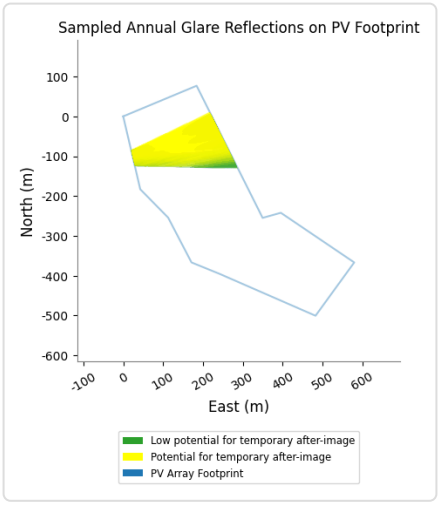
Yellow glare: 3,258 min.

Green glare: 1,657 min.





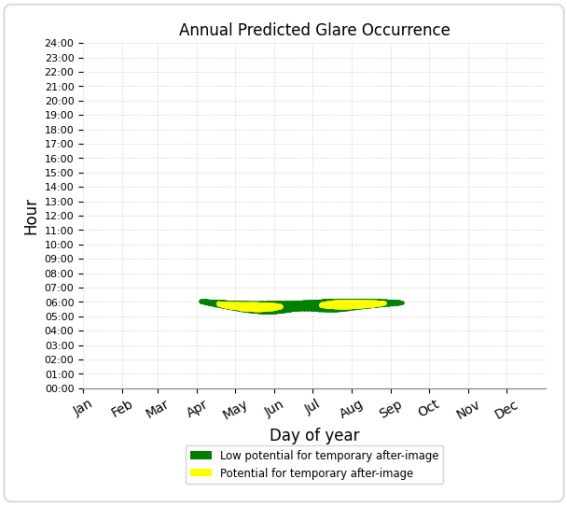


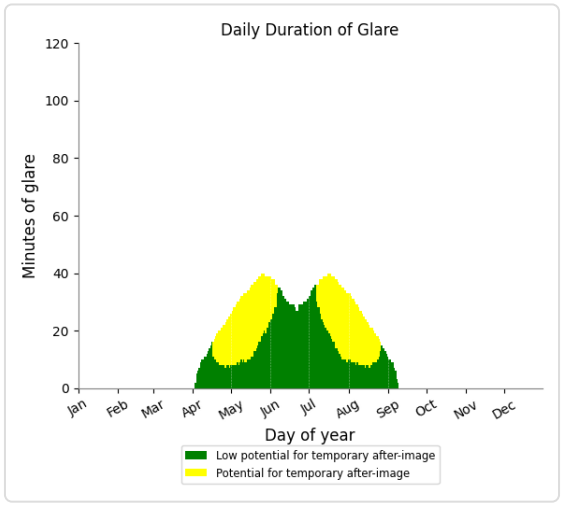


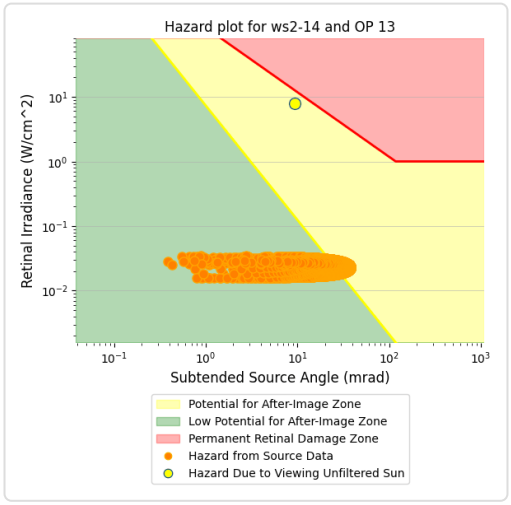
WS2 - 14 and OP 13

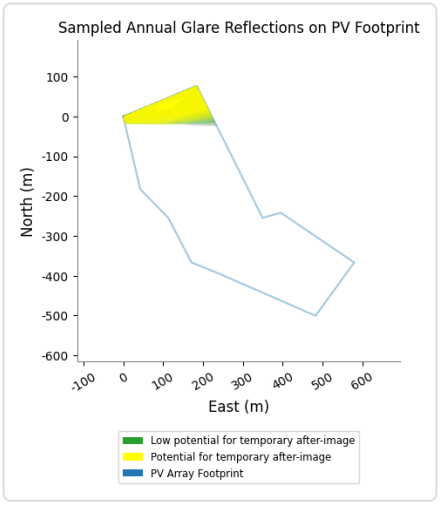
Yellow glare: 1,826 min.

Green glare: 2,550 min.





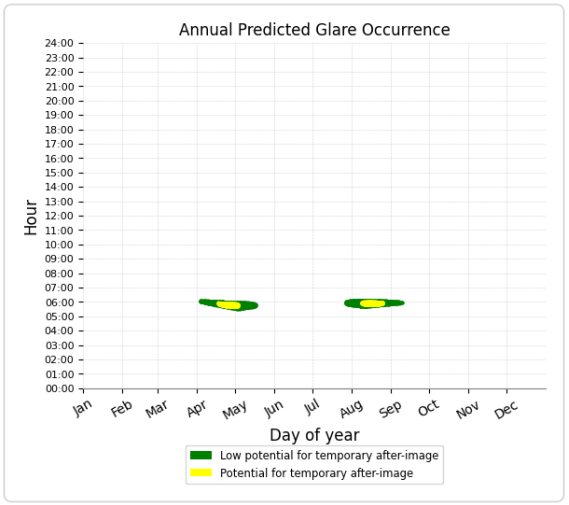


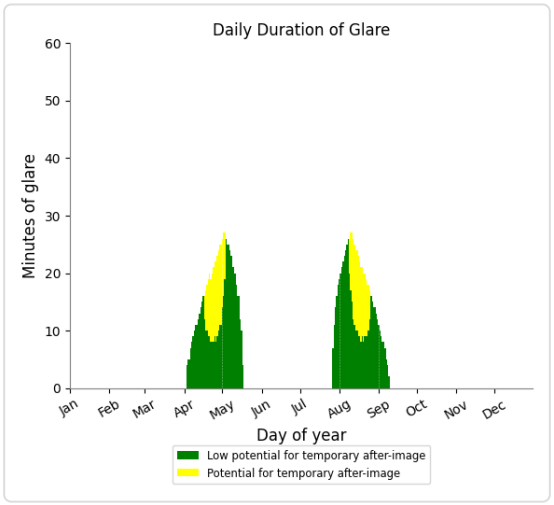


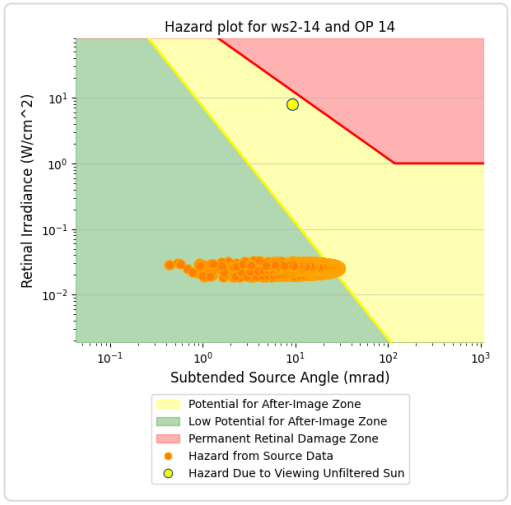
WS2 - 14 and OP 14

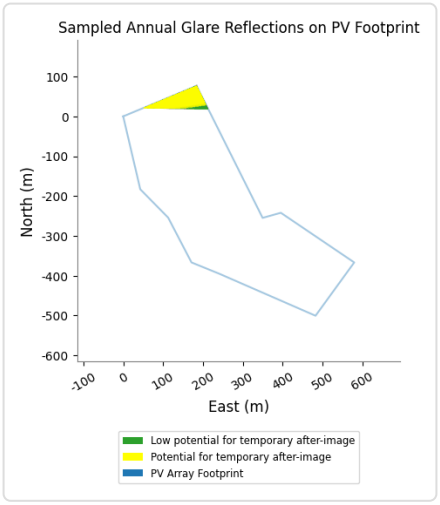
Yellow glare: 381 min.

Green glare: 1,163 min.





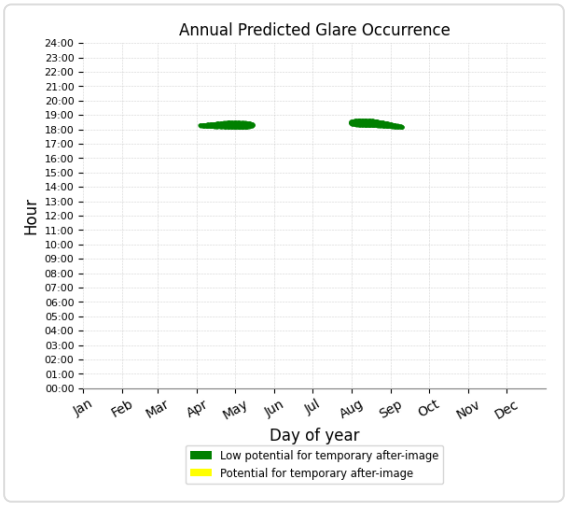


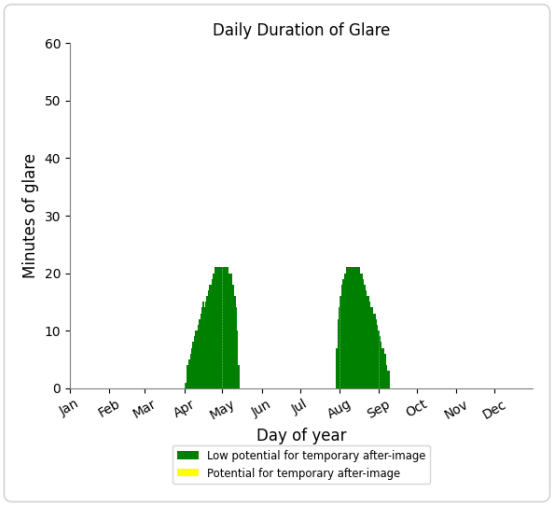


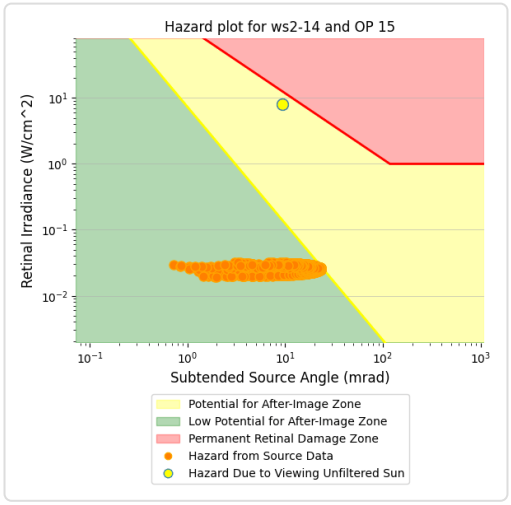
WS2 - 14 and OP 15

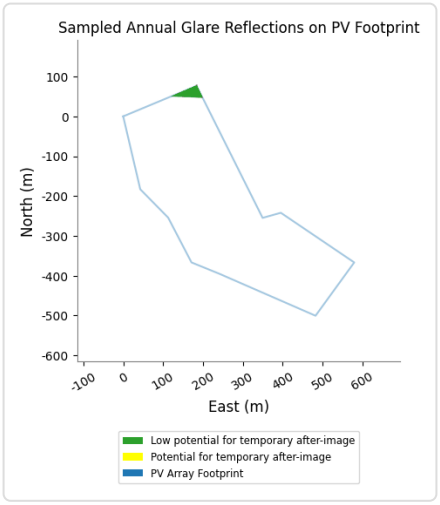
Yellow glare: none

Green glare: 1,269 min.









WS2 - 14 and OP 1

No glare found

WS2 - 14 and OP 2

No glare found

WS2 - 14 and OP 5

No glare found

WS2 - 14 and OP 6

No glare found

WS2 - 14 and OP 7

No glare found

WS2 - 14 and OP 8

No glare found

WS2 - 14 and OP 9

No glare found

WS2 - 14 and OP 16

No glare found

PV: WS2 - 15 potential temporary after-image

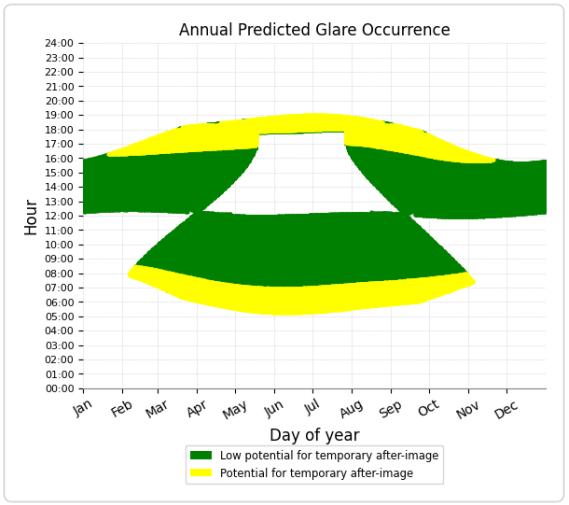
Receptor results ordered by category of glare

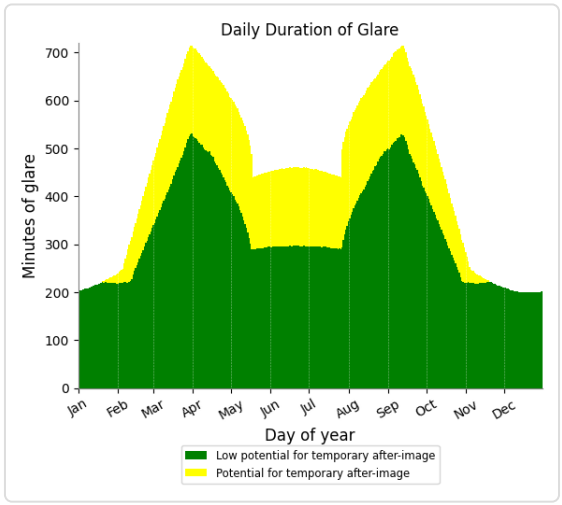
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2B	120,433	2,007.2	44,433	740.5
PRoW 5B	2,082	34.7	2,763	46.0
Route 1B - Part 1	930	15.5	4,209	70.2
Route 1B - Part 2	827	13.8	4,143	69.0
Route 2B	70	1.2	2,440	40.7
Route 3B	478	8.0	6,354	105.9
PRoW 1B	16	0.3	0	0.0
Route 4B	0	0.0	0	0.0
OP 2	1,924	32.1	1,339	22.3
OP 3	1,655	27.6	4,355	72.6
OP 4	1,981	33.0	2,899	48.3
OP 7	897	14.9	3,924	65.4
OP 8	1,500	25.0	3,731	62.2
OP 9	1,392	23.2	2,786	46.4
OP 10	1,571	26.2	2,296	38.3
OP 11	1,774	29.6	2,839	47.3
OP 12	812	13.5	3,158	52.6
OP 13	1,022	17.0	3,234	53.9
OP 14	868	14.5	3,322	55.4
OP 15	370	6.2	2,507	41.8
OP 16	1,786	29.8	3,085	51.4
OP 1	339	5.7	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0

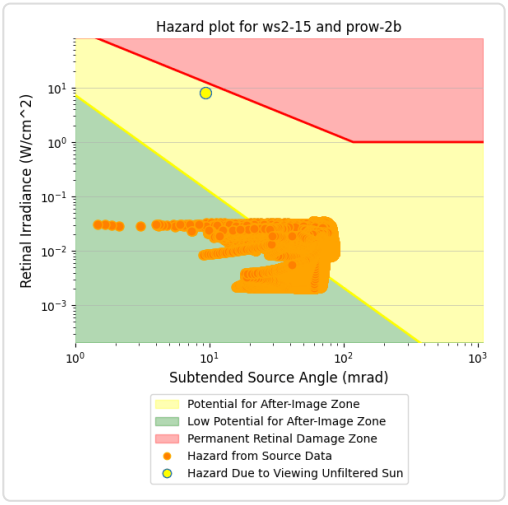
WS2 - 15 and Route: PRoW 2B

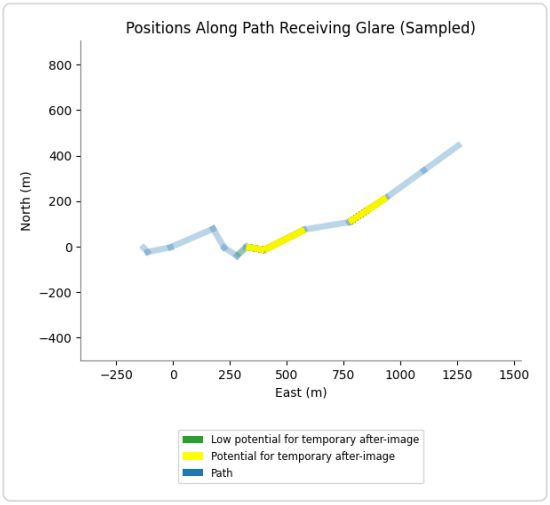
Yellow glare: 44,433 min.

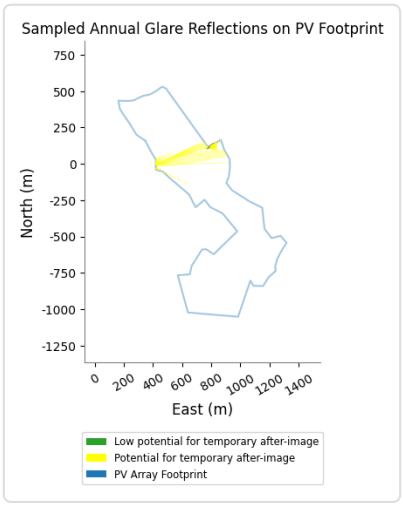
Green glare: 120,433 min.







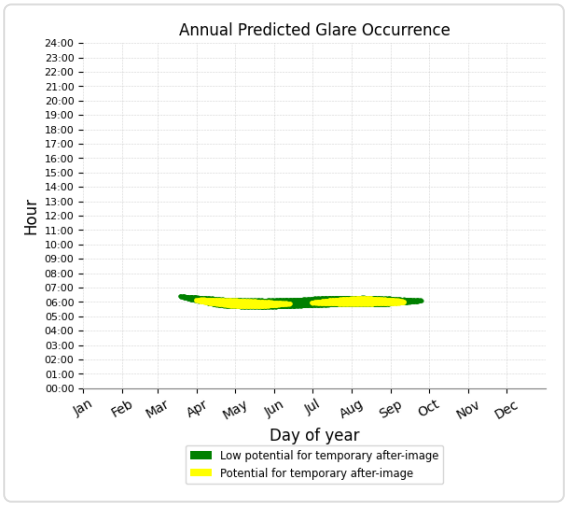


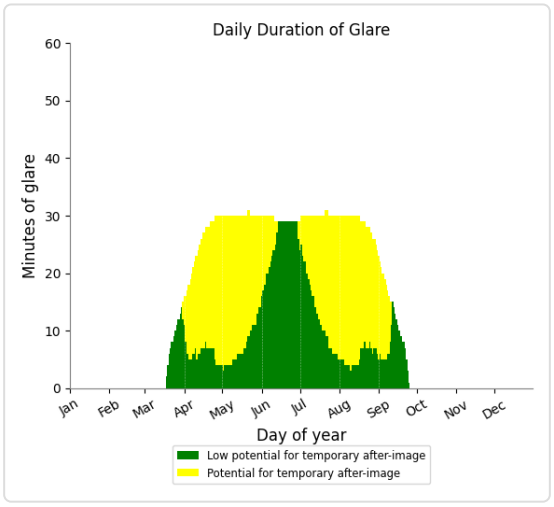


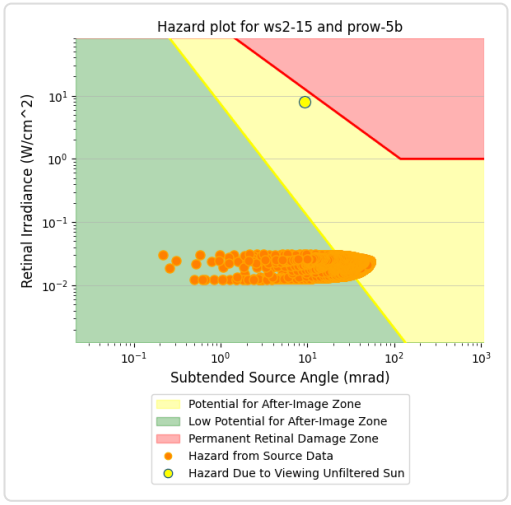
WS2 - 15 and Route: PRoW 5B

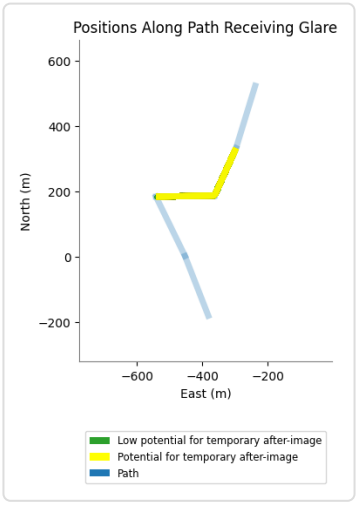
Yellow glare: 2,763 min.

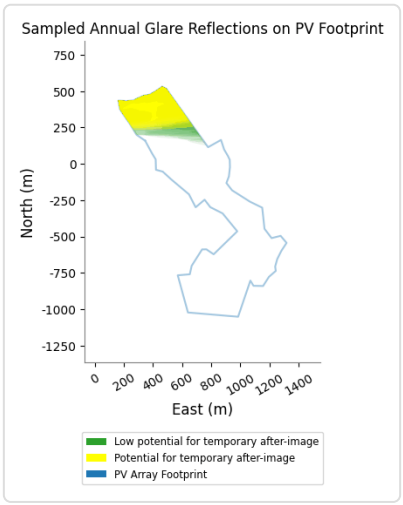
Green glare: 2,082 min.







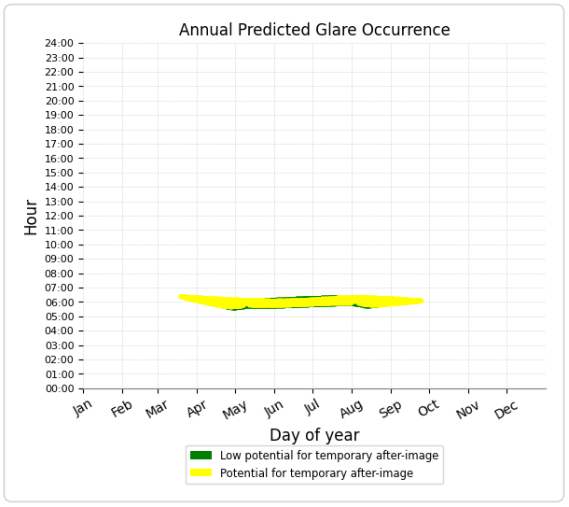


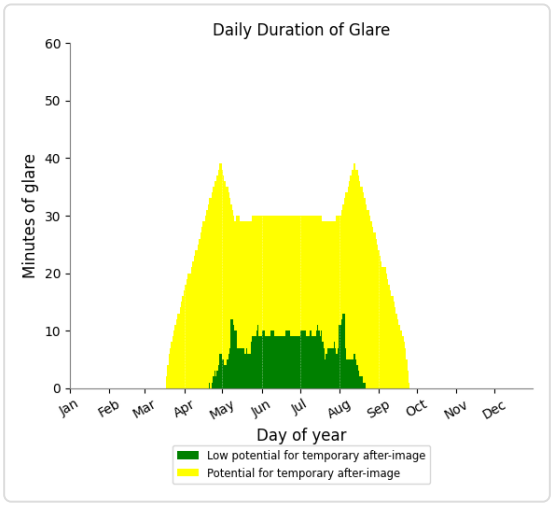


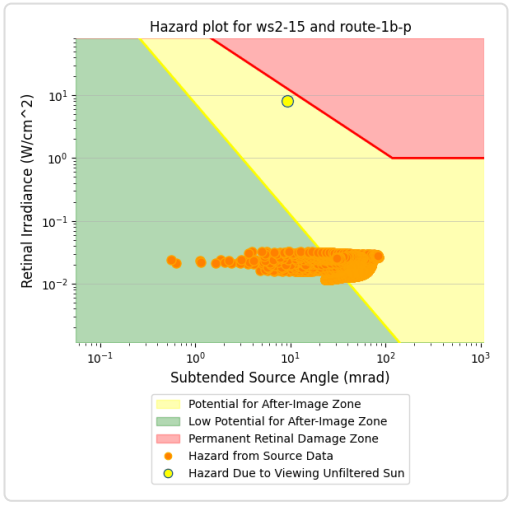
WS2 - 15 and Route: Route 1B - Part 1

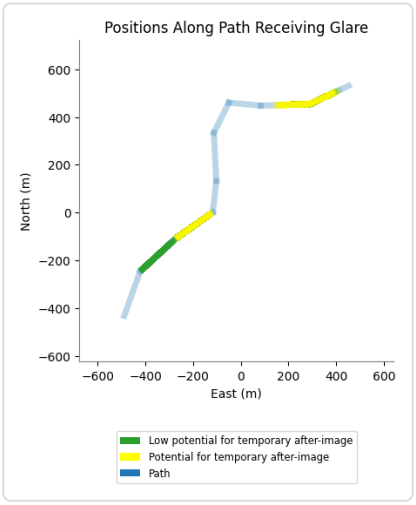
Yellow glare: 4,209 min.

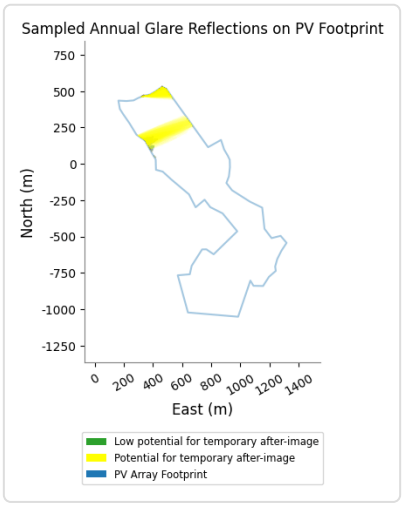
Green glare: 930 min.







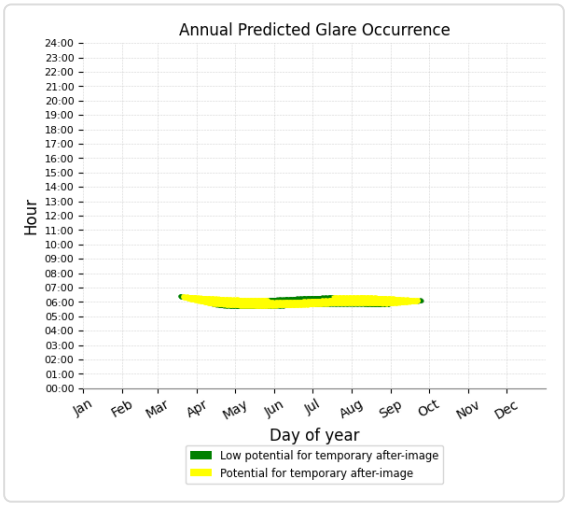


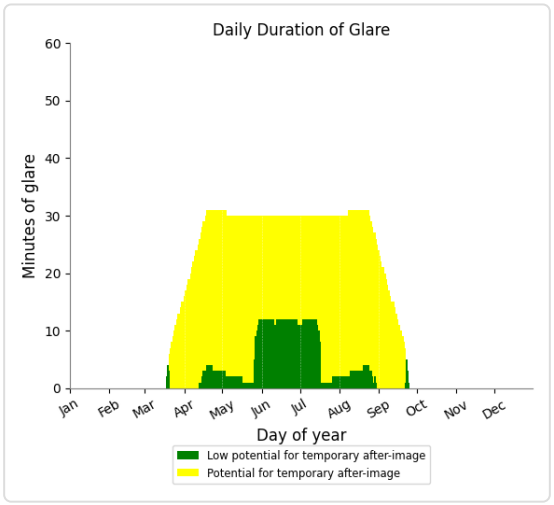


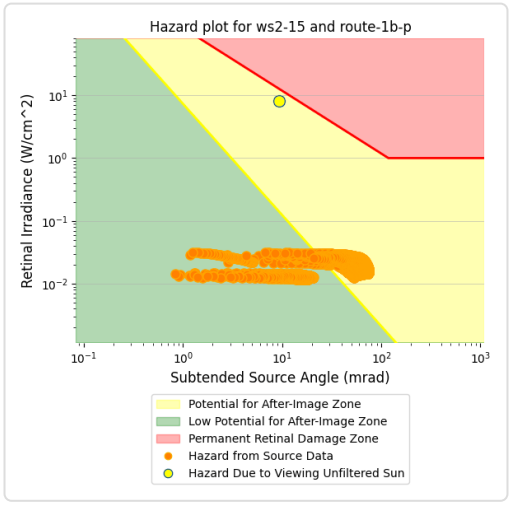
WS2 - 15 and Route: Route 1B - Part 2

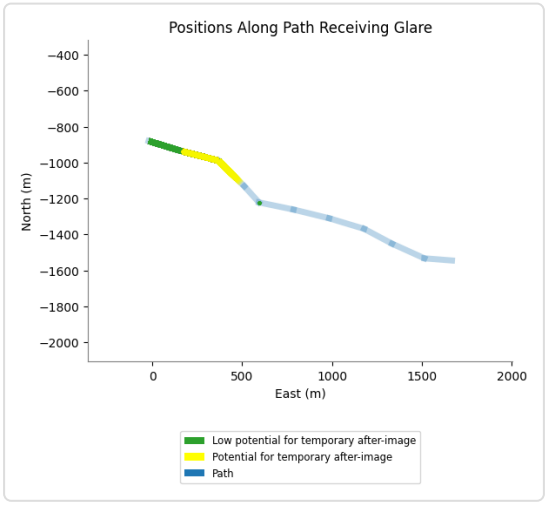
Yellow glare: 4,143 min.

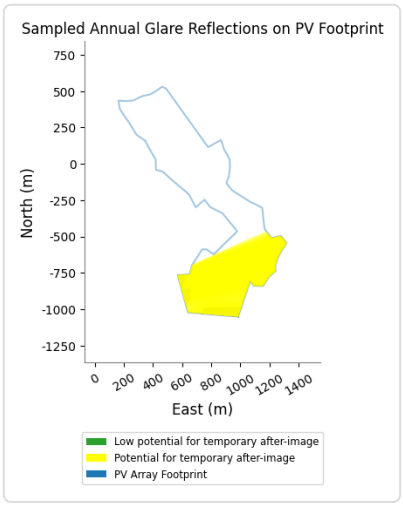
Green glare: 827 min.







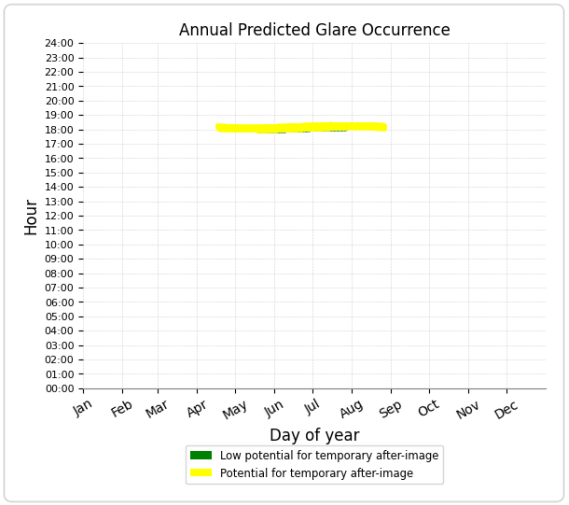


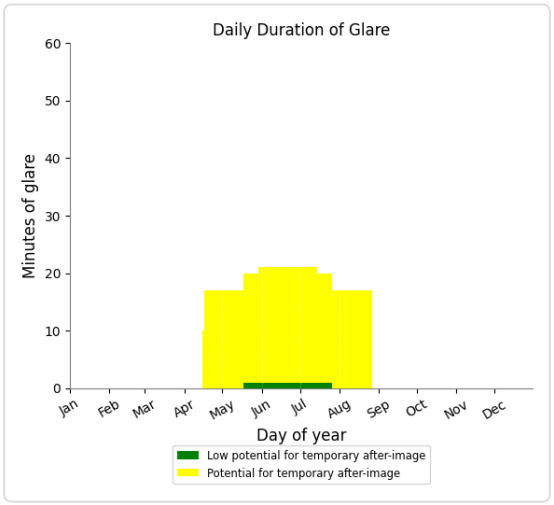


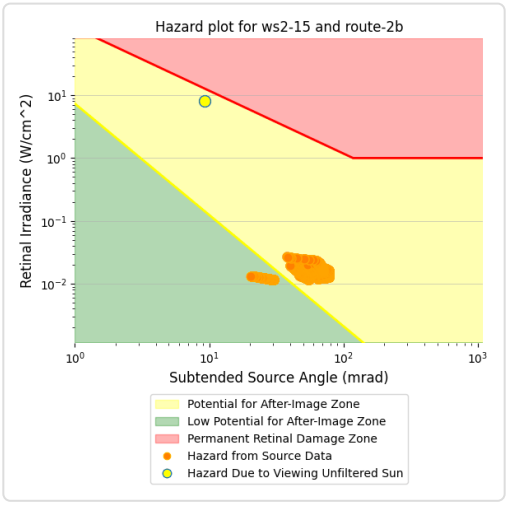
WS2 - 15 and Route: Route 2B

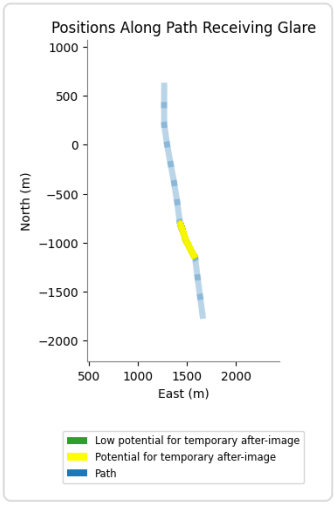
Yellow glare: 2,440 min.

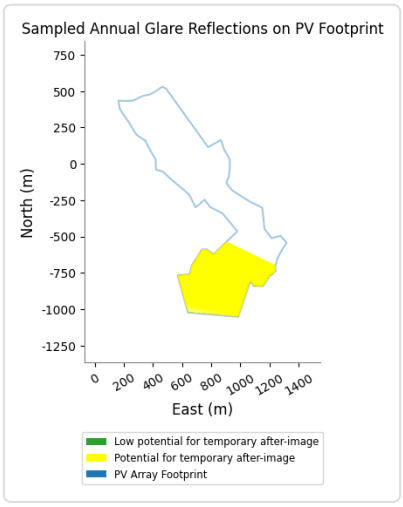
Green glare: 70 min.







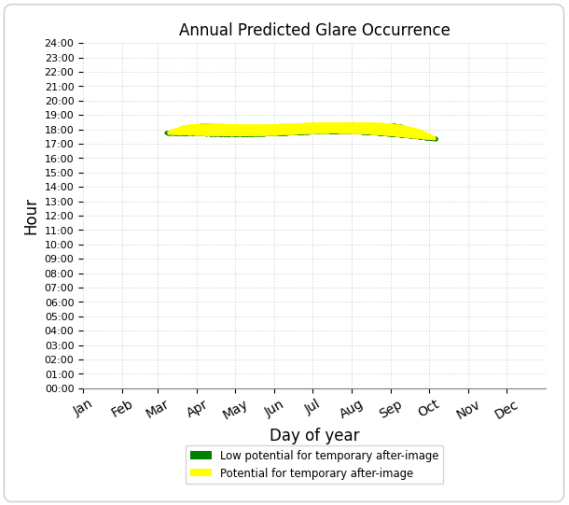


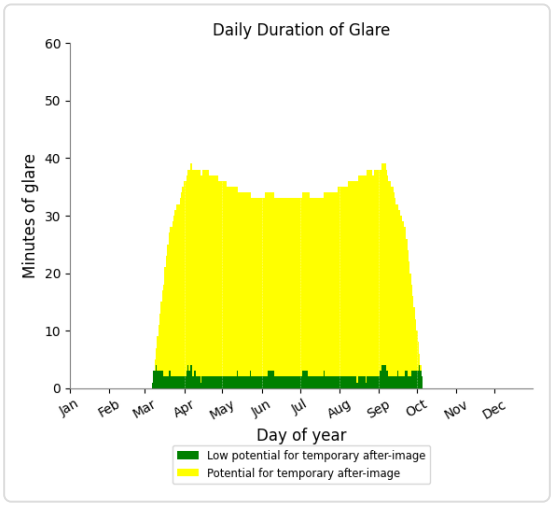


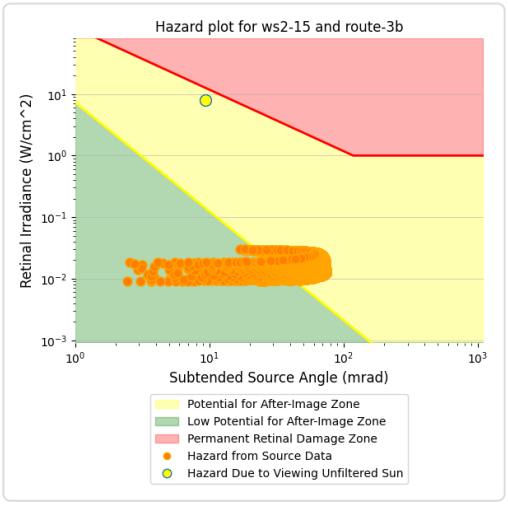
WS2 - 15 and Route: Route 3B

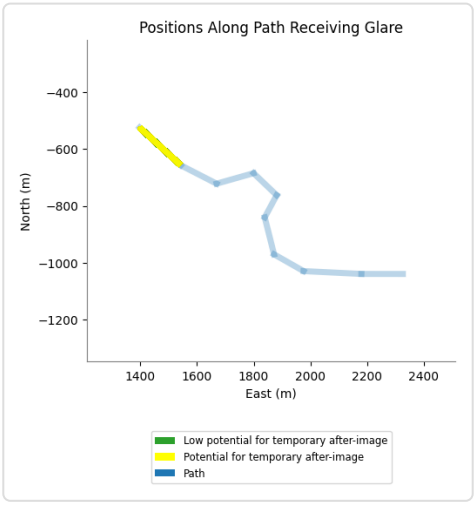
Yellow glare: 6,354 min.

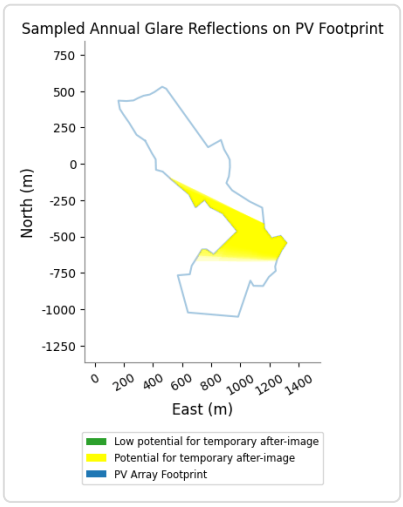
Green glare: 478 min.







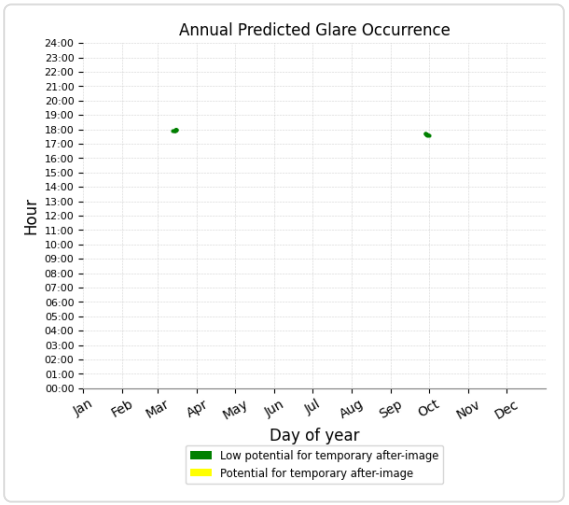


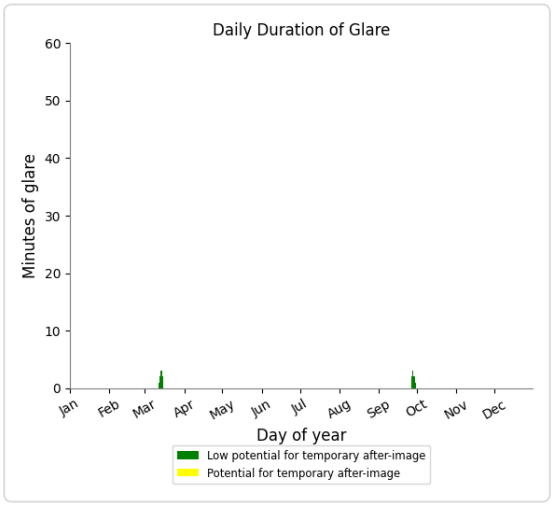


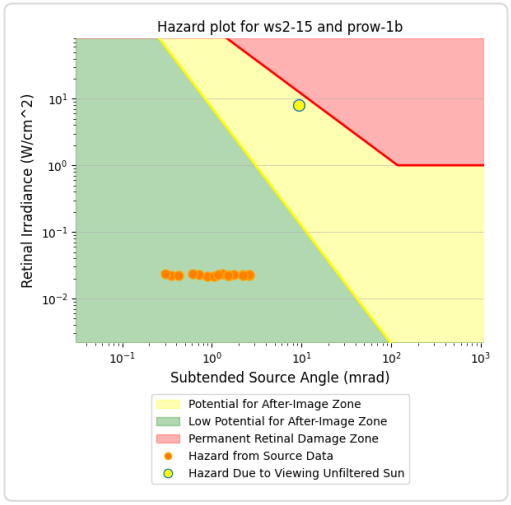
WS2 - 15 and Route: PRoW 1B

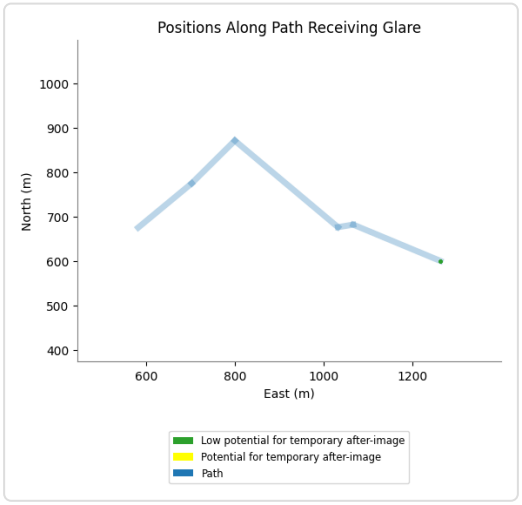
Yellow glare: none

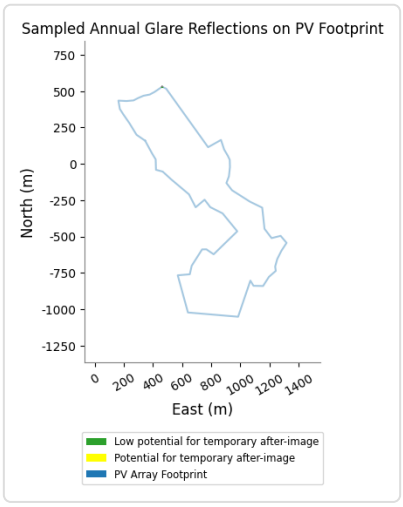
Green glare: 16 min.











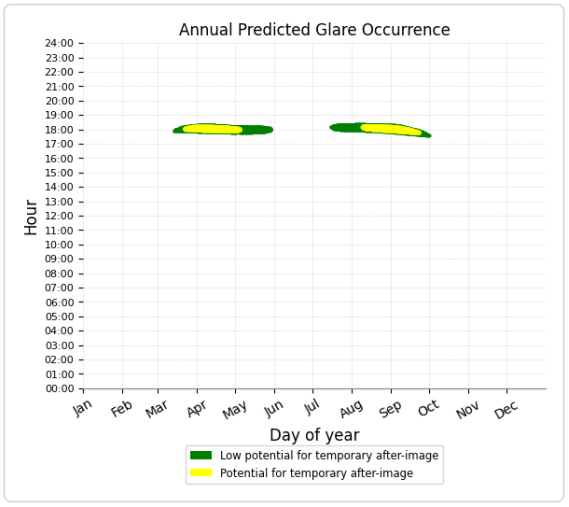
WS2 - 15 and Route: Route 4B

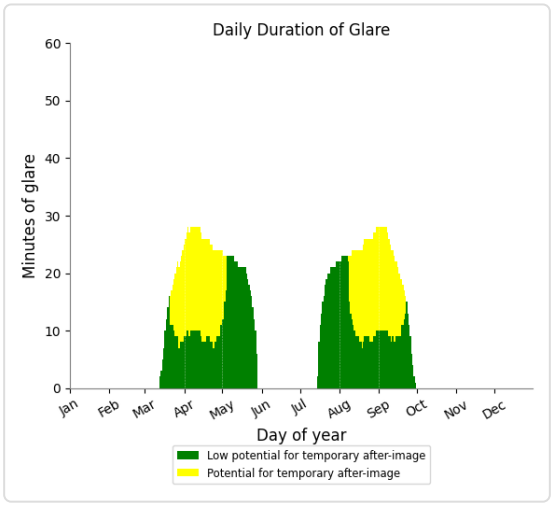
No glare found

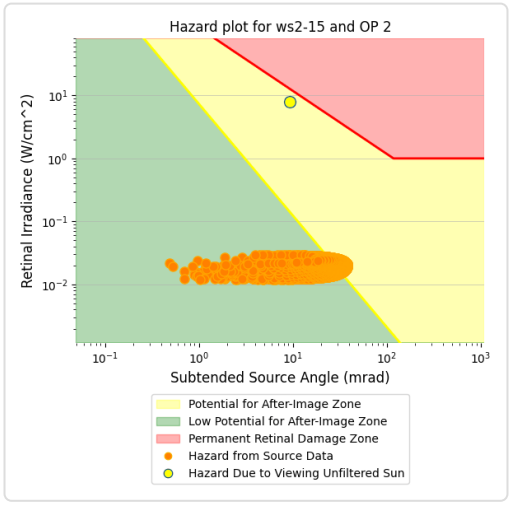
WS2 - 15 and OP 2

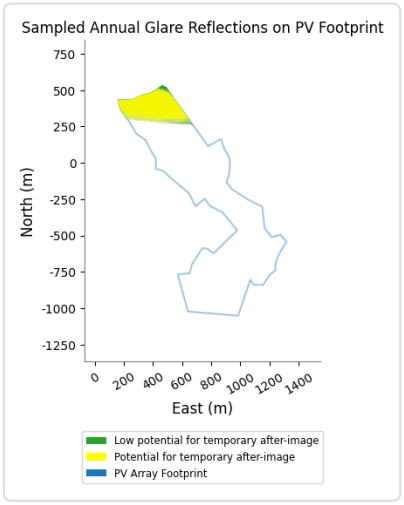
Yellow glare: 1,339 min.

Green glare: 1,924 min.





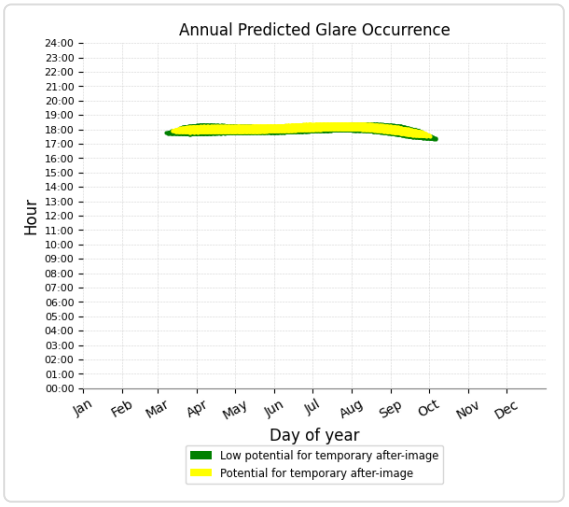


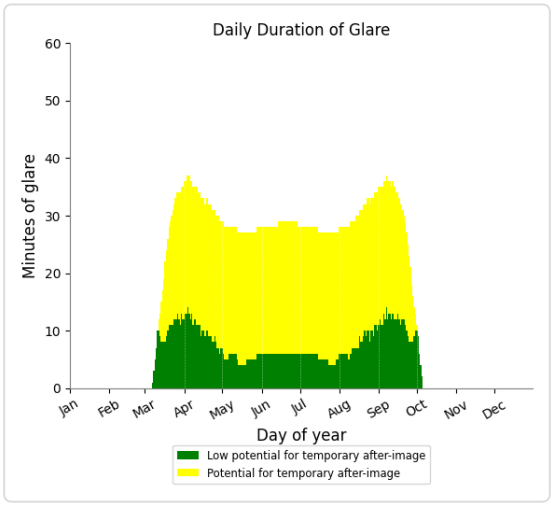


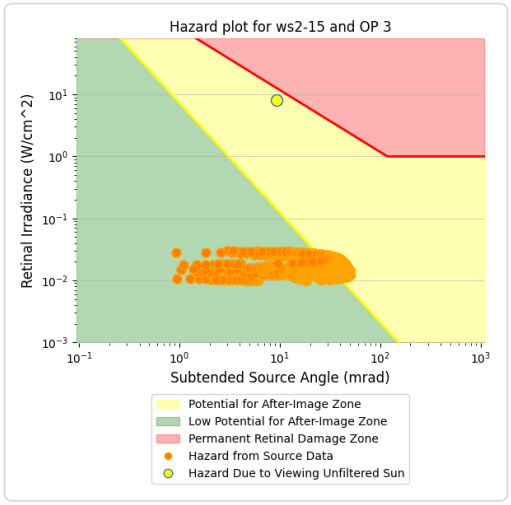
WS2 - 15 and OP 3

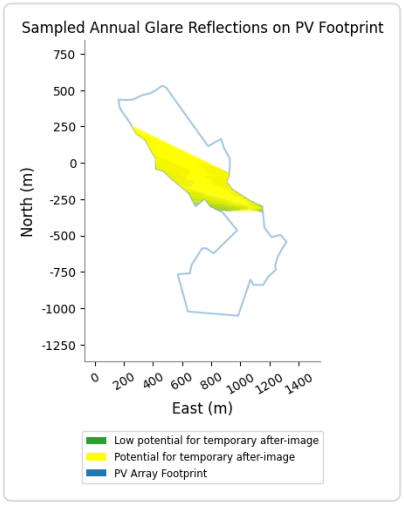
Yellow glare: 4,355 min.

Green glare: 1,655 min.





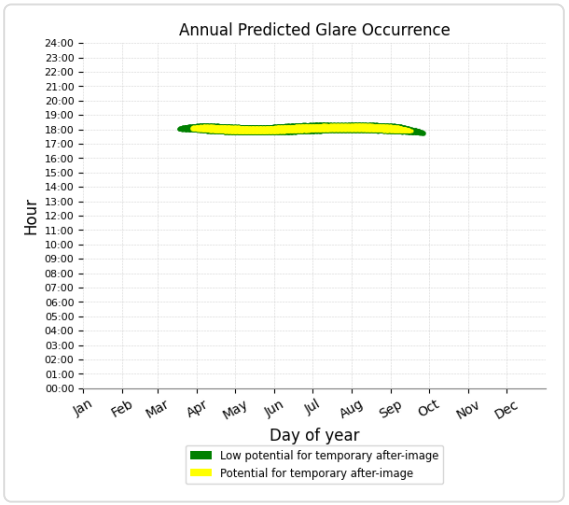


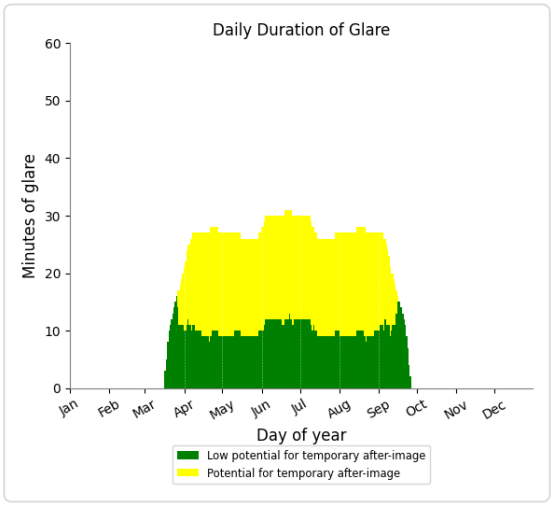


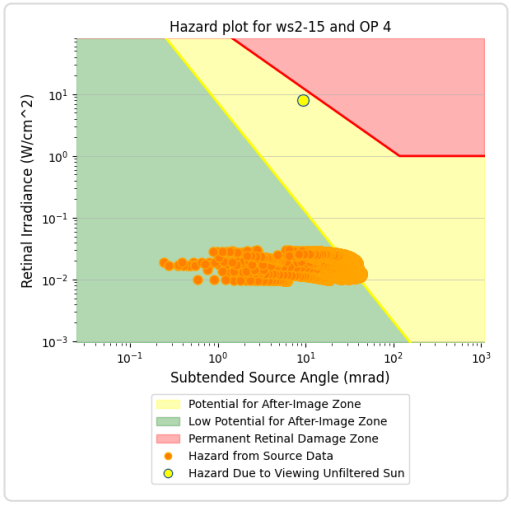
WS2 - 15 and OP 4

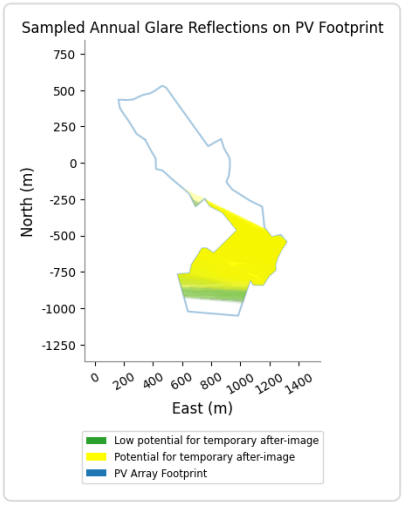
Yellow glare: 2,899 min.

Green glare: 1,981 min.





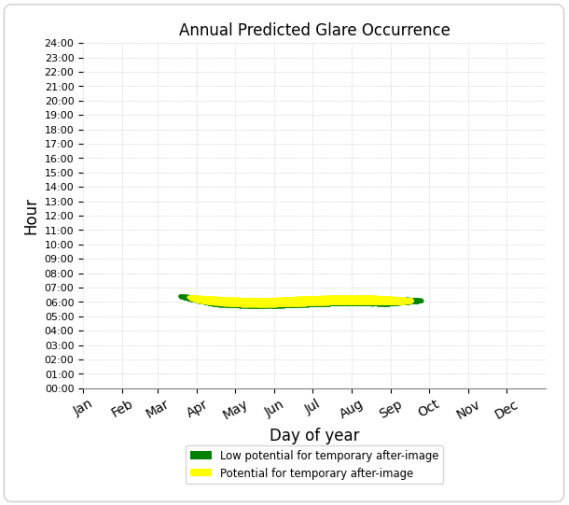


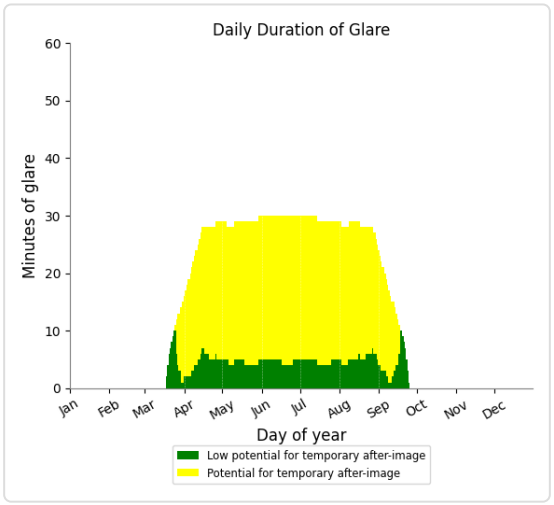


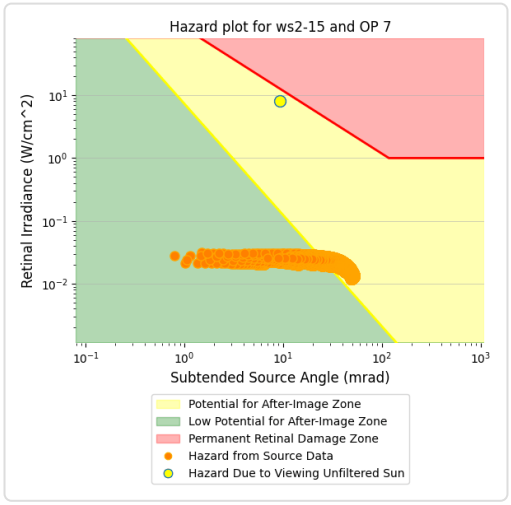
WS2 - 15 and OP 7

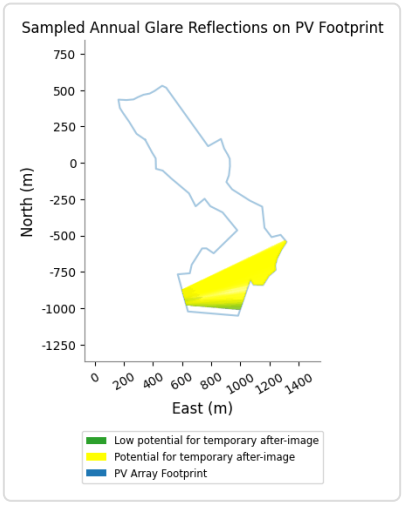
Yellow glare: 3,924 min.

Green glare: 897 min.





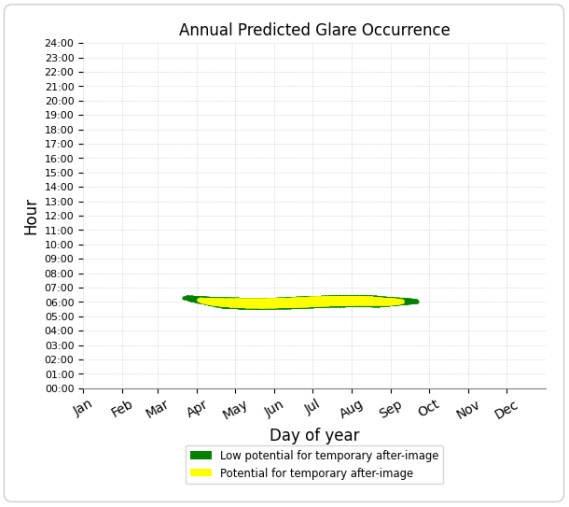


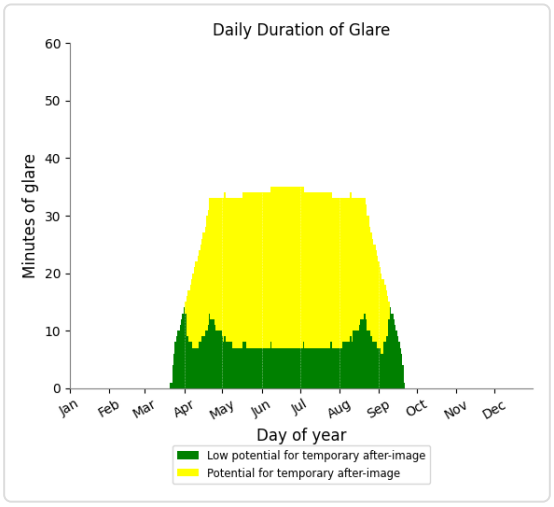


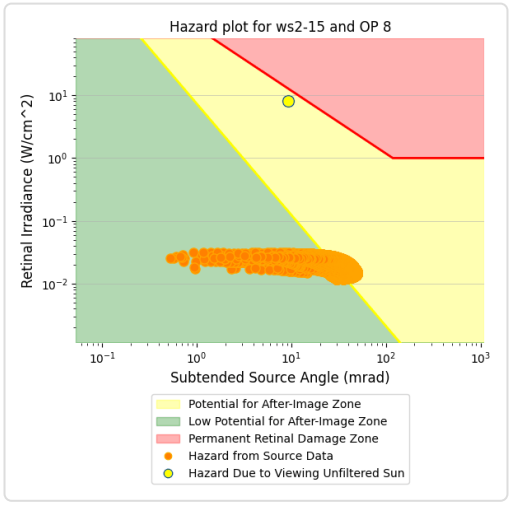
WS2 - 15 and OP 8

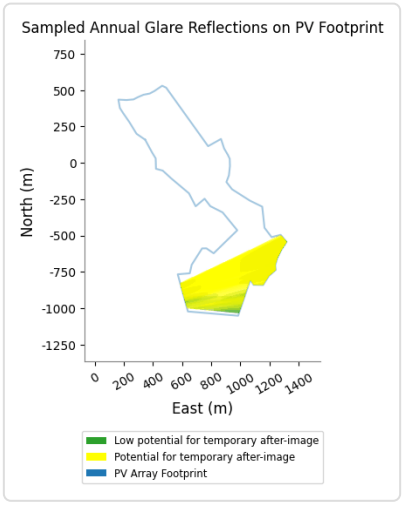
Yellow glare: 3,731 min.

Green glare: 1,500 min.





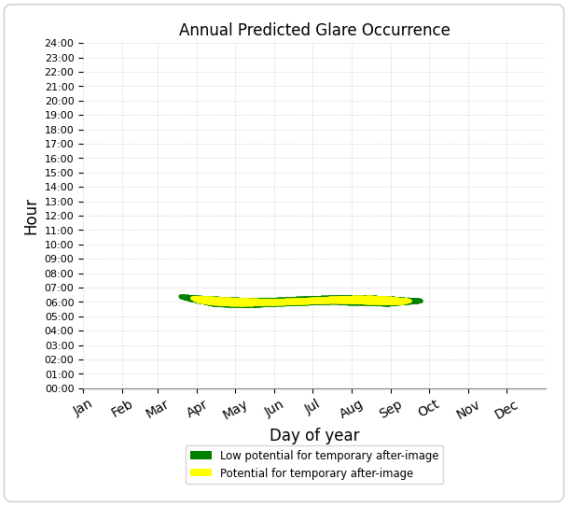


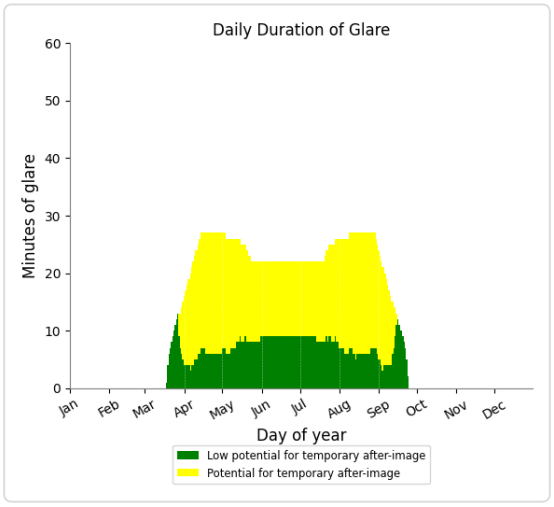


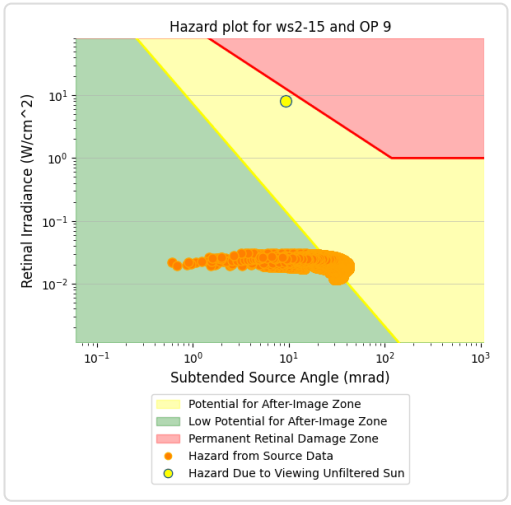
WS2 - 15 and OP 9

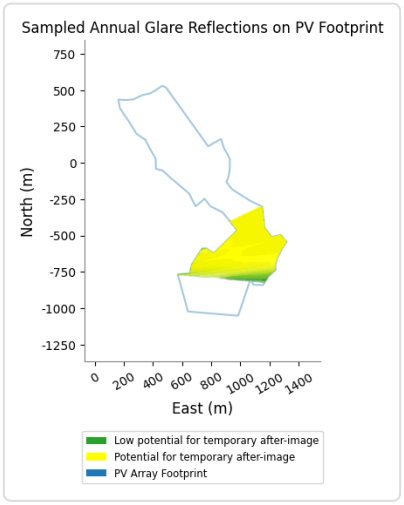
Yellow glare: 2,786 min.

Green glare: 1,392 min.





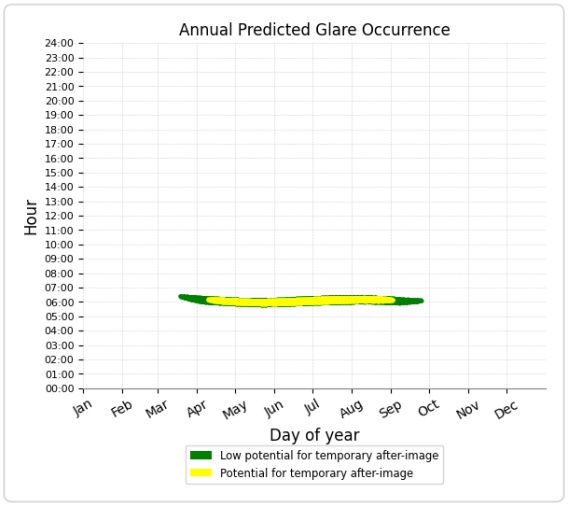


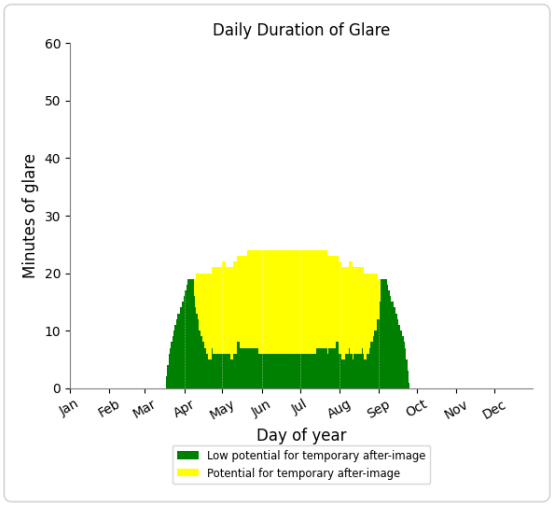


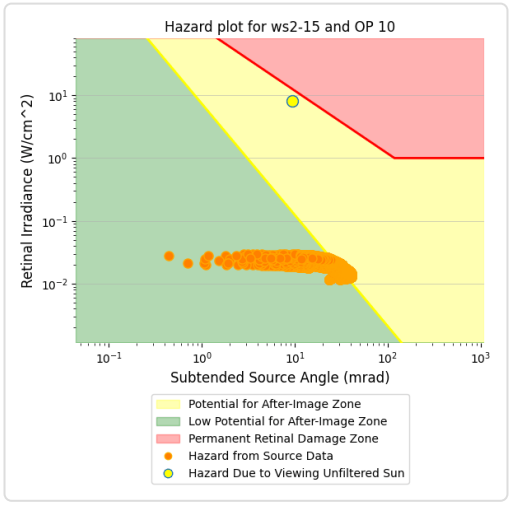
WS2 - 15 and OP 10

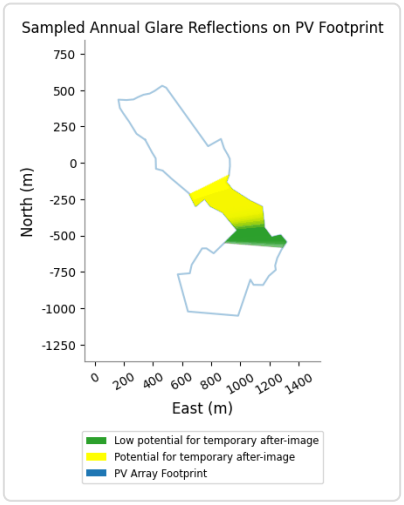
Yellow glare: 2,296 min.

Green glare: 1,571 min.





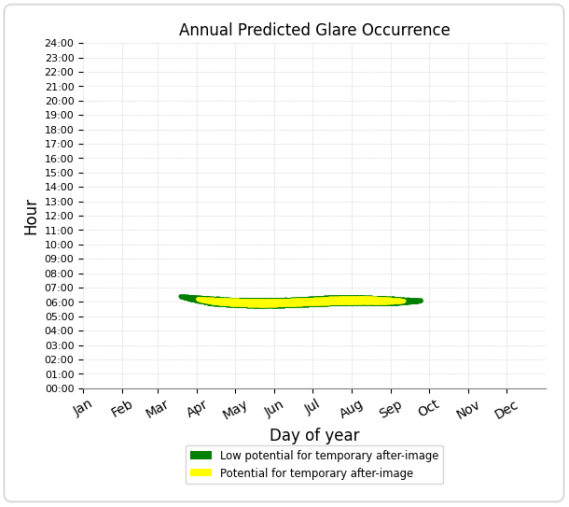


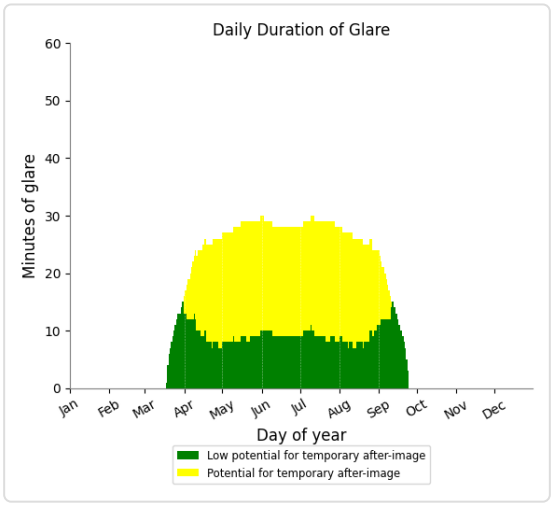


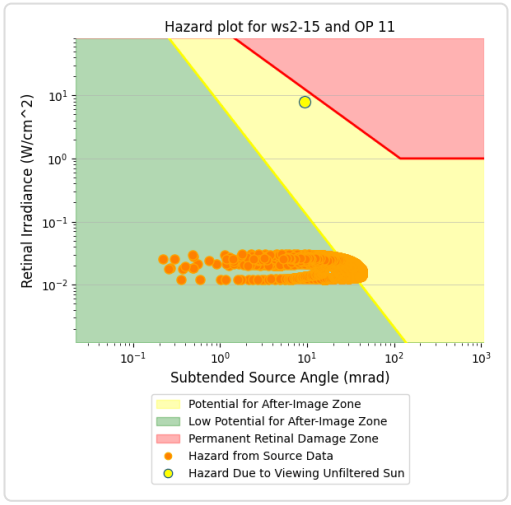
WS2 - 15 and OP 11

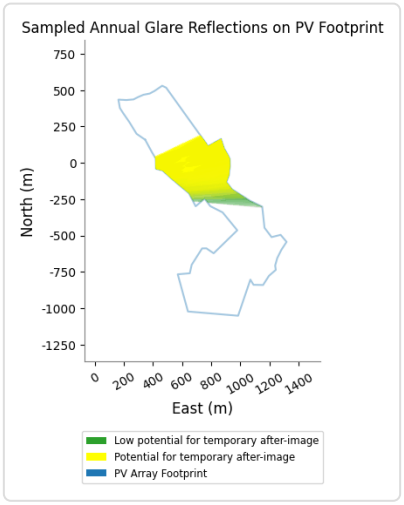
Yellow glare: 2,839 min.

Green glare: 1,774 min.





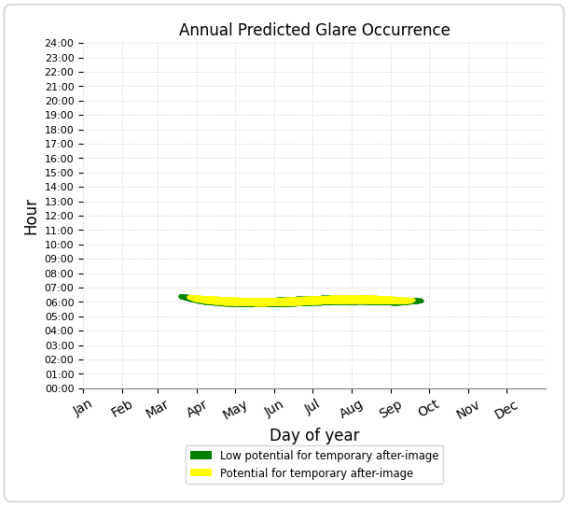


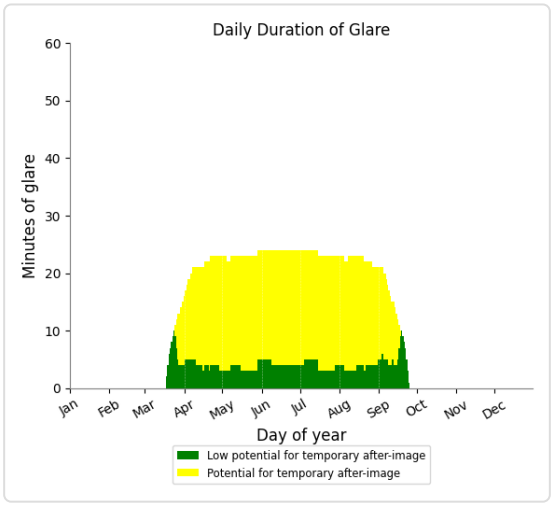


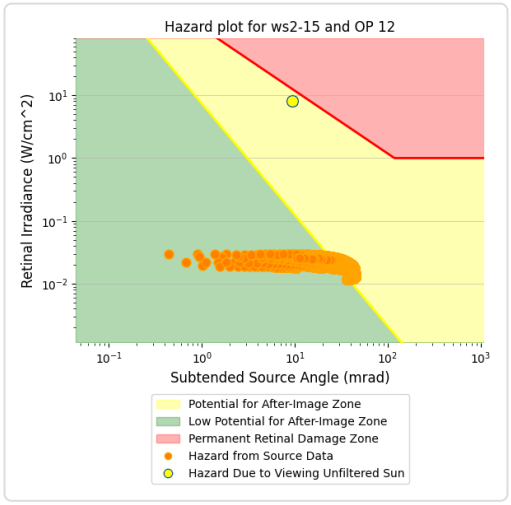
WS2 - 15 and OP 12

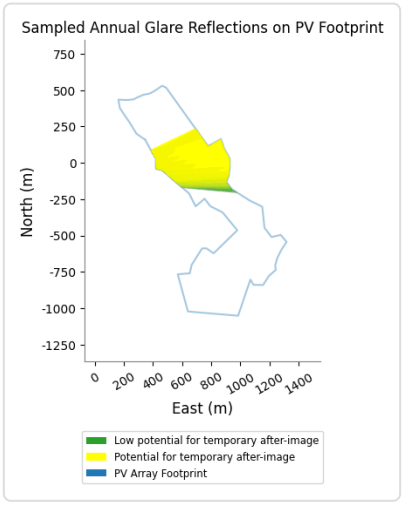
Yellow glare: 3,158 min.

Green glare: 812 min.





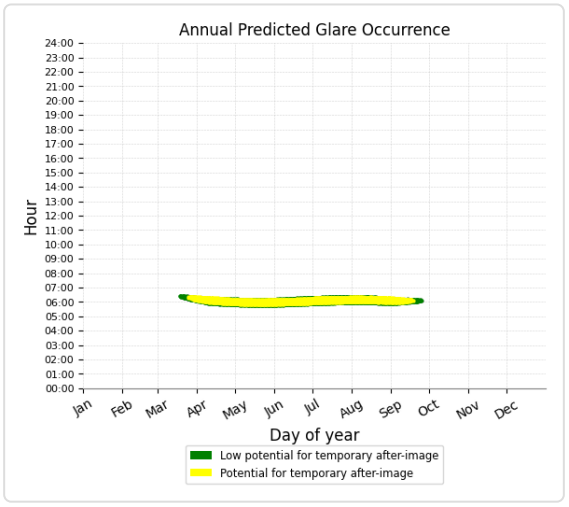


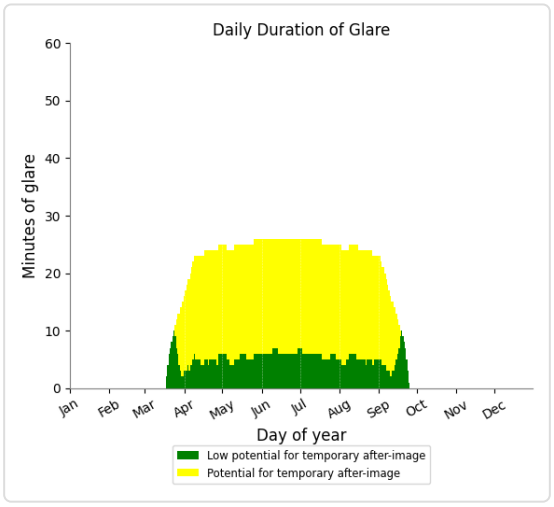


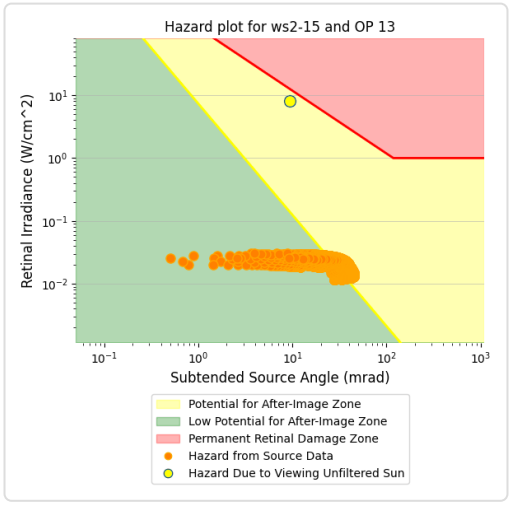
WS2 - 15 and OP 13

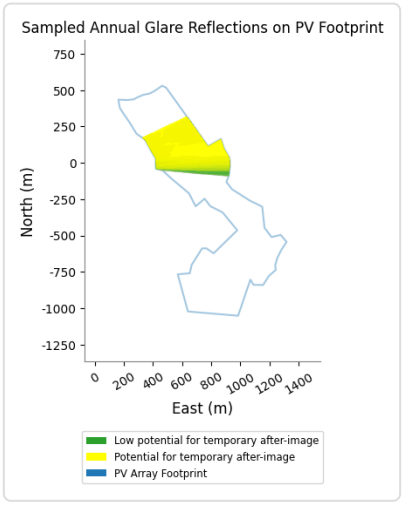
Yellow glare: 3,234 min.

Green glare: 1,022 min.





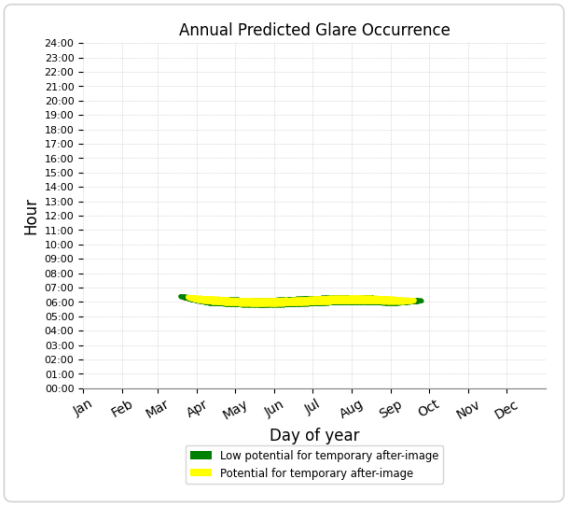


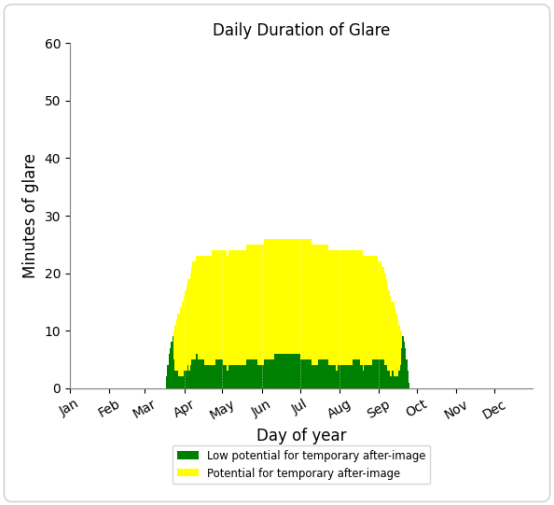


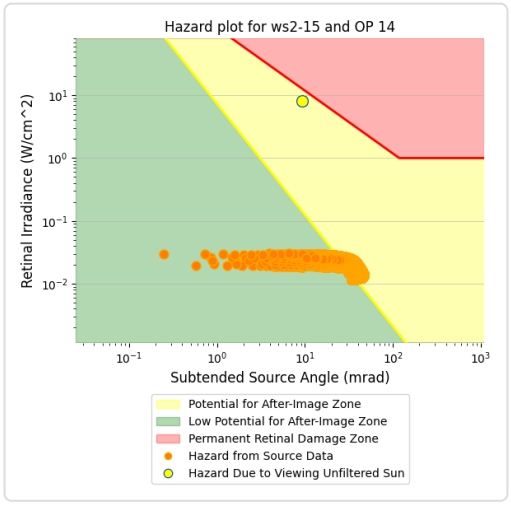
WS2 - 15 and OP 14

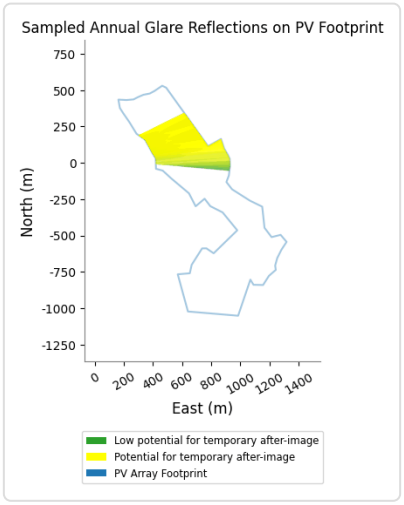
Yellow glare: 3,322 min.

Green glare: 868 min.





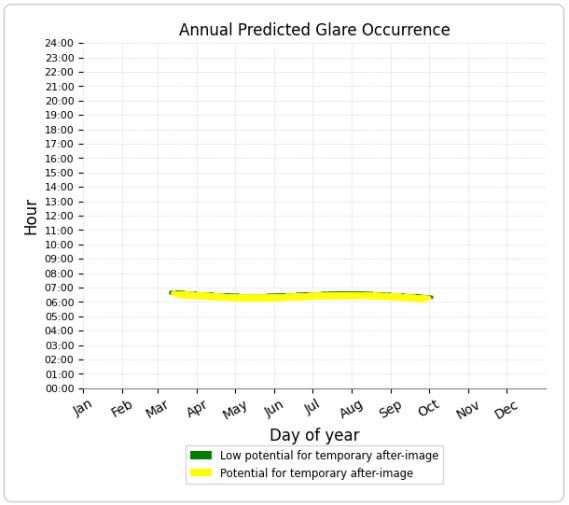


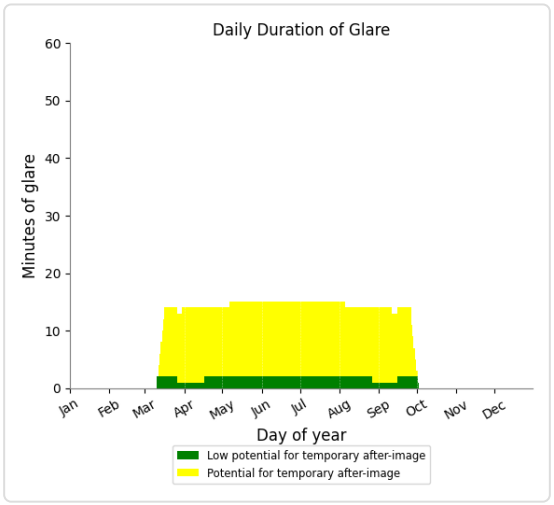


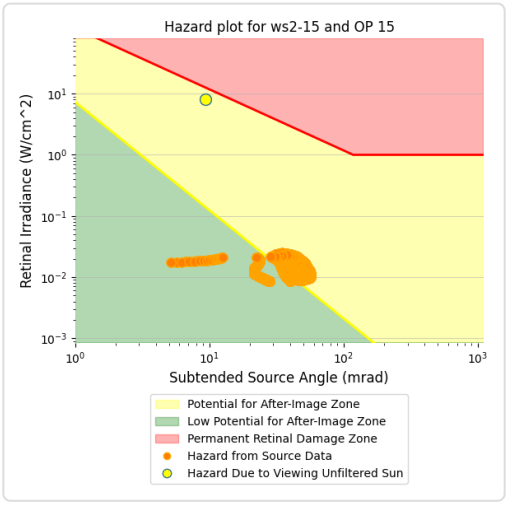
WS2 - 15 and OP 15

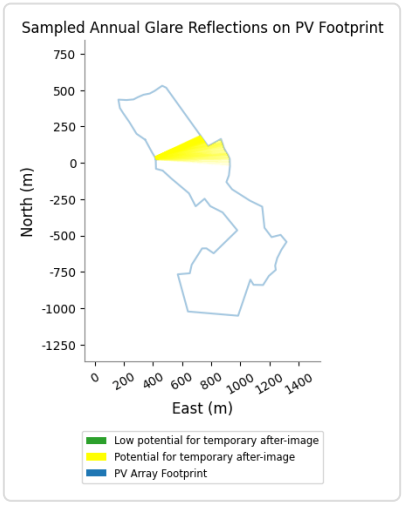
Yellow glare: 2,507 min.

Green glare: 370 min.





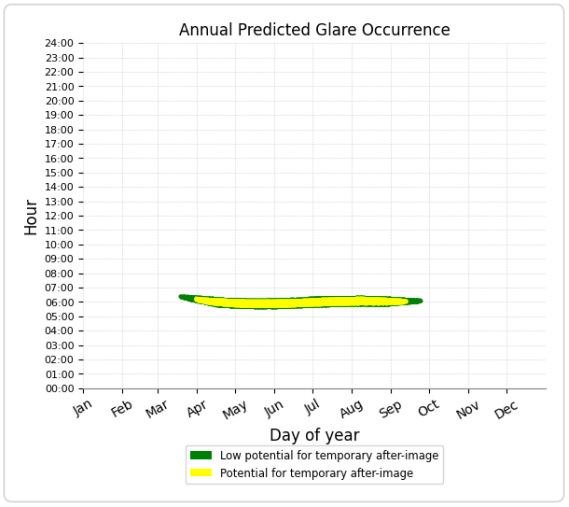


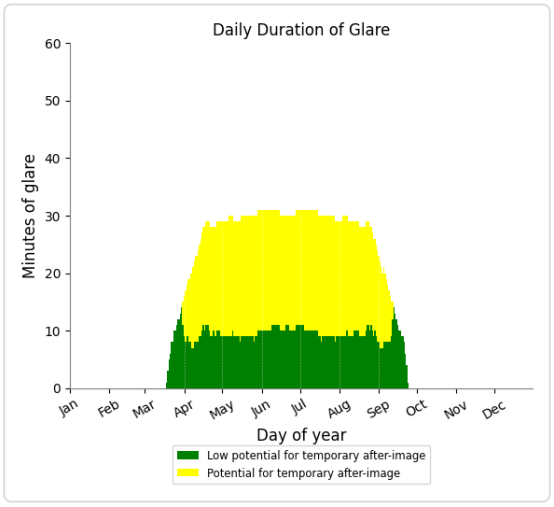


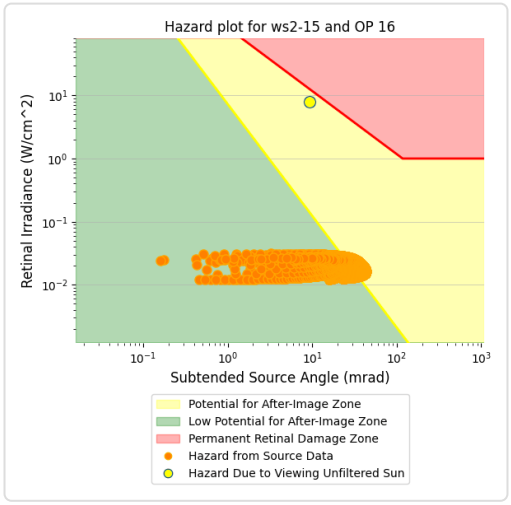
WS2 - 15 and OP 16

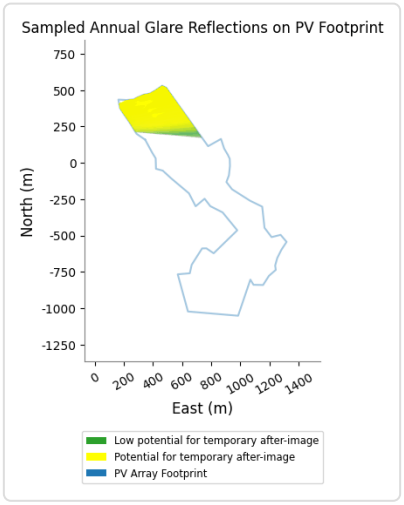
Yellow glare: 3,085 min.

Green glare: 1,786 min.





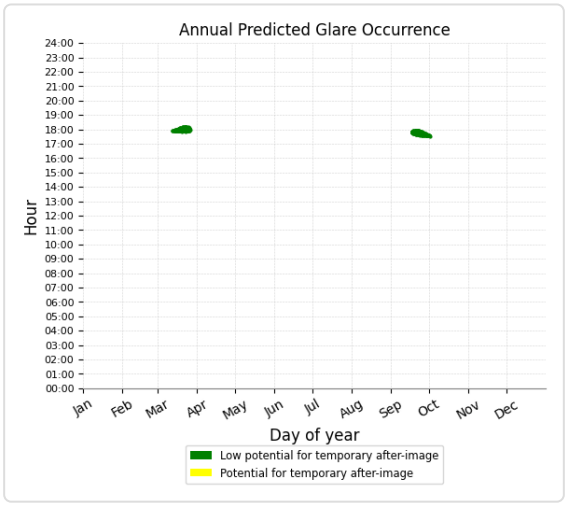


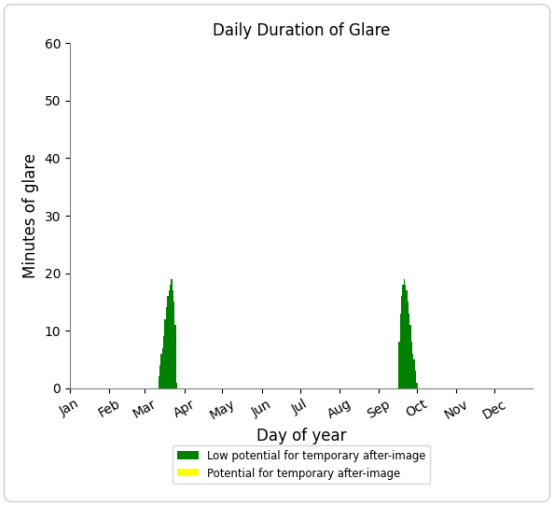


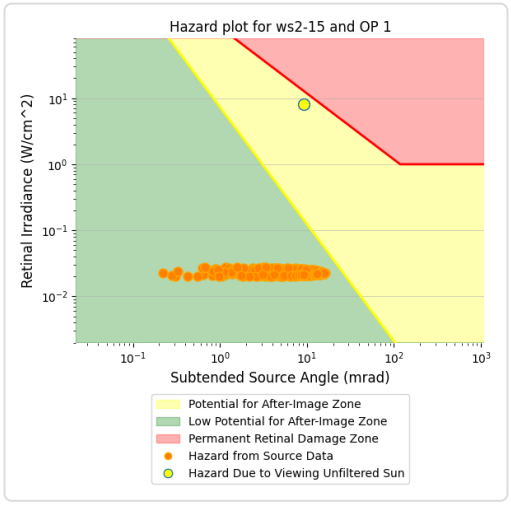
WS2 - 15 and OP 1

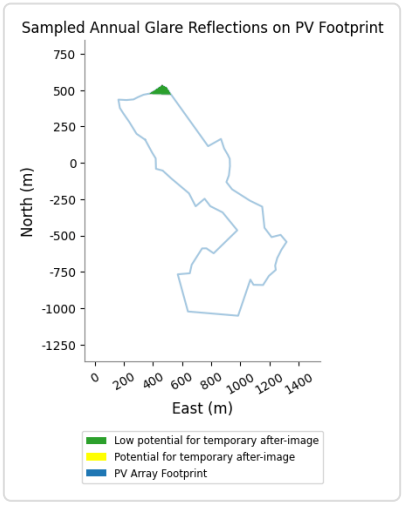
Yellow glare: none

Green glare: 339 min.









WS2 - 15 and OP 5

No glare found

WS2 - 15 and OP 6

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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W2C

W2 Area	OP No. in Glare Analysis	Residential Receptor No.
A	1	1
A	2	2
A	3	3
A	4	4
A	5	5
A	6	6
A	7	7
A	8	8
A	9	9
A	10	10
A	11	11
A	12	12
A	13	13
A	14	14
A	15	15
A	16	16
A	17	17
B	1	18
B	2	19
B	3	20
B	4	21
B	5	22
B	6	23
B	7	24
B	8	25
B	9	26
B	10	27
B	11	28
B	12	29
B	13	30
B	14	31
B	15	32
B	16	33
C	1	34
C	2	35

C	3	36
C	4	37
C	5	38
C	6	39
C	7	40
C	8	41
C	9	42
C	10	43
C	11	44
C	12	45
C	13	46
C	14	47
C	15	48
C	16	49
C	17	50
C	18	51
C	19	52
C	20	53
C	21	22
C	22	54
C	23	55
C	24	56
C	25	57
C	26	58
C	27	59
C	28	60
C	29	61
C	30	62
C	31	21
C	32	20
C	33	19
C	34	63
C	35	18
C	36	64
C	37	65
D	1	66
D	2	67
D	3	68
D	4	69
D	5	70
D	6	71

D	7	72
D	8	73
D	9	74
D	10	75
D	11	76
D	12	77
D	13	78
D	14	79
D	15	80
D	16	81
D	17	82
D	18	83
D	19	84
D	20	43
D	21	42
D	22	85
D	23	41
D	24	40
D	25	86
D	26	37
D	27	39
D	28	38
D	29	36
D	30	35
E	1	87
E	2	88
E	3	89
E	4	90
E	5	91
E	6	92
E	7	93
E	8	94
E	9	95
E	10	96
E	11	97
E	12	98
E	13	99
E	14	100
E	15	101
E	16	102
E	17	103

E	18	104
E	19	105
E	20	106
E	21	107
E	22	82
E	23	81
E	24	79
E	25	78
E	26	80
E	27	77
E	28	76
E	29	75

FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **W2C**

Created 24 Jun, 2025
Updated 04 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153218.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	239,121	3,985.3	188,802	3,146.7	-
PV array 2	8.0	180.0	148,091	2,468.2	200,186	3,336.4	-
PV array 3	8.0	180.0	33,385	556.4	38,892	648.2	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1C	83,181	1,386.3	60,473	1,007.9
PRoW 2C	127,225	2,120.4	96,131	1,602.2
PRoW 3C	2,692	44.9	10,336	172.3
PRoW 4C	0	0.0	0	0.0
PRoW 5C	5,199	86.7	3,687	61.5
PRoW 6C	18,187	303.1	26,291	438.2
PRoW 7C	95,675	1,594.6	97,387	1,623.1
PRoW 9C	2,759	46.0	1,581	26.4
Route 1C	7,790	129.8	8,654	144.2
Route 1C - Part 2	5,939	99.0	13,639	227.3
Route 2C	0	0.0	0	0.0
Route 3C	1,667	27.8	4,908	81.8
Route 4C	3,791	63.2	5,455	90.9
Route 5C	110	1.8	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 6C	1,578	26.3	10,106	168.4
OP 1	821	13.7	404	6.7
OP 2	2,101	35.0	4,587	76.5
OP 3	2,440	40.7	3,347	55.8
OP 4	2,228	37.1	2,862	47.7
OP 5	2,217	37.0	3,393	56.5
OP 6	2,542	42.4	3,122	52.0
OP 7	2,213	36.9	1,286	21.4
OP 8	3,041	50.7	1,057	17.6
OP 9	3,392	56.5	1,592	26.5
OP 10	744	12.4	190	3.2
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	1,076	17.9	0	0.0
OP 15	1,313	21.9	0	0.0
OP 16	1,876	31.3	71	1.2
OP 17	3,313	55.2	2,498	41.6
OP 18	3,683	61.4	5,503	91.7
OP 19	4,588	76.5	2,398	40.0
OP 20	2,222	37.0	695	11.6
OP 21	2,119	35.3	459	7.7
OP 22	8,896	148.3	17,498	291.6
OP 23	924	15.4	3,450	57.5
OP 24	1,148	19.1	4,518	75.3
OP 25	1,090	18.2	3,727	62.1
OP 26	920	15.3	3,429	57.1
OP 27	1,112	18.5	4,057	67.6
OP 28	1,008	16.8	3,761	62.7
OP 29	956	15.9	3,459	57.6
OP 30	928	15.5	3,405	56.8
OP 31	760	12.7	59	1.0
OP 32	627	10.4	2,048	34.1
OP 33	652	10.9	0	0.0
OP 34	1,577	26.3	5,379	89.7
OP 35	225	3.8	0	0.0
OP 36	0	0.0	0	0.0
OP 37	2,052	34.2	978	16.3

Component Data

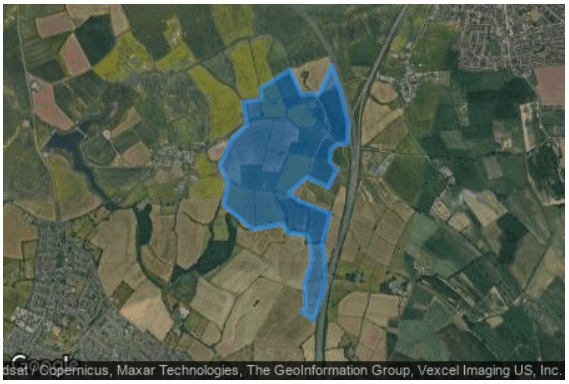
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



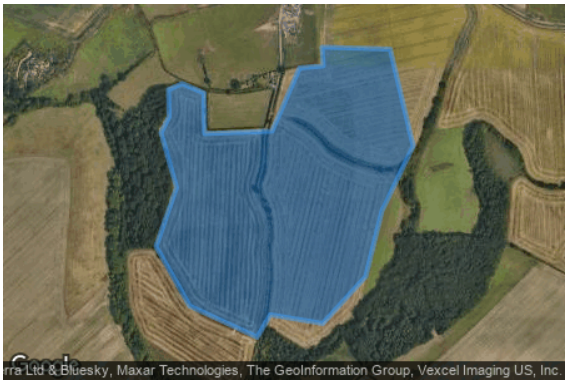
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.397918	-1.309154	92.10	3.80	95.90
2	53.397073	-1.296537	102.80	3.80	106.60
3	53.396536	-1.296494	102.00	3.80	105.80
4	53.396229	-1.299069	102.80	3.80	106.60
5	53.391239	-1.296150	67.30	3.80	71.10
6	53.389370	-1.301858	62.40	3.80	66.20
7	53.389217	-1.304691	61.00	3.80	64.80
8	53.390010	-1.305721	63.60	3.80	67.40
9	53.391187	-1.306965	72.50	3.80	76.30
10	53.389959	-1.310012	76.40	3.80	80.20
11	53.391008	-1.311385	90.20	3.80	94.00
12	53.392032	-1.310441	89.90	3.80	93.70
13	53.395359	-1.304734	101.50	3.80	105.30
14	53.395768	-1.305034	103.10	3.80	106.90
15	53.395845	-1.306836	102.70	3.80	106.50

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.389486	-1.287224	97.30	3.80	101.10
2	53.387975	-1.291301	99.40	3.80	103.20
3	53.387080	-1.291215	101.60	3.80	105.40
4	53.386849	-1.293661	101.10	3.80	104.90
5	53.384955	-1.293189	99.20	3.80	103.00
6	53.383855	-1.295249	99.00	3.80	102.80
7	53.381628	-1.296880	95.80	3.80	99.60
8	53.380168	-1.295764	94.10	3.80	97.90
9	53.378453	-1.296408	91.70	3.80	95.50
10	53.376431	-1.292417	110.90	3.80	114.70
11	53.376866	-1.288168	106.30	3.80	110.10
12	53.376175	-1.287567	109.00	3.80	112.80
13	53.375970	-1.284950	106.00	3.80	109.80
14	53.375202	-1.284477	108.70	3.80	112.50
15	53.374024	-1.284220	113.80	3.80	117.60
16	53.372027	-1.285250	116.60	3.80	120.40
17	53.370030	-1.285121	119.50	3.80	123.30
18	53.369748	-1.285722	116.70	3.80	120.50
19	53.369031	-1.283920	114.90	3.80	118.70
20	53.371746	-1.282418	112.20	3.80	116.00
21	53.373640	-1.282375	112.10	3.80	115.90
22	53.375330	-1.282718	112.10	3.80	115.90
23	53.377736	-1.281688	105.00	3.80	108.80
24	53.378786	-1.285937	99.20	3.80	103.00
25	53.379426	-1.287353	98.10	3.80	101.90
26	53.380680	-1.284907	99.80	3.80	103.60
27	53.379887	-1.281945	103.70	3.80	107.50
28	53.381256	-1.280808	105.00	3.80	108.80
29	53.381999	-1.281709	102.10	3.80	105.90
30	53.382959	-1.281602	103.70	3.80	107.50
31	53.383355	-1.280765	106.00	3.80	109.80
32	53.383471	-1.279306	110.50	3.80	114.30
33	53.385186	-1.279242	116.20	3.80	120.00
34	53.387732	-1.280315	113.40	3.80	117.20
35	53.389844	-1.281430	103.60	3.80	107.40
36	53.387425	-1.283340	111.20	3.80	115.00
37	53.387553	-1.284606	108.40	3.80	112.20
38	53.387412	-1.285593	107.70	3.80	111.50

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.378389	-1.306214	83.40	3.80	87.20
2	53.377839	-1.306193	82.00	3.80	85.80
3	53.377506	-1.306472	80.00	3.80	83.80
4	53.376392	-1.305935	83.20	3.80	87.00
5	53.375189	-1.306643	79.10	3.80	82.90
6	53.373973	-1.305485	82.90	3.80	86.70
7	53.373333	-1.303167	79.20	3.80	83.00
8	53.373794	-1.302716	81.50	3.80	85.30
9	53.373615	-1.300914	78.50	3.80	82.30
10	53.374575	-1.299433	86.00	3.80	89.80
11	53.375919	-1.298876	92.80	3.80	96.60
12	53.377237	-1.297803	90.80	3.80	94.60
13	53.379221	-1.298597	103.00	3.80	106.80
14	53.379260	-1.300936	111.80	3.80	115.60
15	53.378876	-1.300893	111.70	3.80	115.50
16	53.378837	-1.301708	108.10	3.80	111.90
17	53.377544	-1.302652	103.20	3.80	107.00
18	53.377493	-1.304970	90.00	3.80	93.80
19	53.378325	-1.304991	91.60	3.80	95.40
20	53.378517	-1.305742	86.60	3.80	90.40

Route Receptors

Name: PRoW 1C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.392373	-1.309987	88.58	2.75	91.33
2	53.390857	-1.308496	81.44	2.75	84.19
3	53.389449	-1.306672	60.55	2.75	63.30
4	53.387690	-1.305846	68.14	2.75	70.89
5	53.386116	-1.304451	78.61	2.75	81.36
6	53.384375	-1.303485	98.14	2.75	100.89
7	53.382807	-1.303045	111.27	2.75	114.02

Name: PRoW 2C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395630	-1.304379	102.94	2.75	105.69
2	53.394063	-1.303167	92.62	2.75	95.37
3	53.392335	-1.302051	81.91	2.75	84.66
4	53.391689	-1.302104	75.71	2.75	78.46
5	53.390410	-1.300388	68.23	2.75	70.98
6	53.389203	-1.298163	75.64	2.75	78.39
7	53.388166	-1.295781	94.37	2.75	97.12
8	53.386950	-1.293786	101.19	2.75	103.94
9	53.385031	-1.293507	99.68	2.75	102.43

Name: PRoW 3C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.396192	-1.294620	99.26	2.75	102.01
2	53.396058	-1.293204	96.45	2.75	99.20
3	53.394362	-1.292002	81.66	2.75	84.41
4	53.393966	-1.289578	89.70	2.75	92.45
5	53.392187	-1.289385	70.21	2.75	72.96
6	53.390677	-1.291123	84.65	2.75	87.40
7	53.389193	-1.292517	92.00	2.75	94.75
8	53.387900	-1.293311	99.16	2.75	101.91
9	53.386953	-1.293805	101.18	2.75	103.93

Name: PRoW 4C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.384848	-1.314340	54.95	2.75	57.70
2	53.383530	-1.312258	85.65	2.75	88.40
3	53.383376	-1.311625	87.78	2.75	90.53
4	53.382973	-1.311357	85.07	2.75	87.82
5	53.381546	-1.309158	89.67	2.75	92.42

Name: PRoW 5C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.374852	-1.316176	92.28	2.75	95.03
2	53.375629	-1.315189	87.41	2.75	90.16
3	53.376701	-1.314374	77.12	2.75	79.87
4	53.377380	-1.313279	64.45	2.75	67.20
5	53.377828	-1.311466	56.89	2.75	59.64
6	53.378359	-1.310983	58.38	2.75	61.13
7	53.378807	-1.309717	64.97	2.75	67.72
8	53.379313	-1.309353	72.80	2.75	75.55
9	53.379786	-1.308451	79.50	2.75	82.25
10	53.380241	-1.307464	87.34	2.75	90.09

Name: PRoW 6C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381629	-1.300662	110.31	2.75	113.06
2	53.380669	-1.298871	101.46	2.75	104.21
3	53.379761	-1.298506	101.53	2.75	104.28
4	53.377764	-1.297197	91.65	2.75	94.40
5	53.377693	-1.295212	104.89	2.75	107.64
6	53.377130	-1.294289	110.06	2.75	112.81
7	53.376609	-1.293840	111.92	2.75	114.67
8	53.376404	-1.292327	111.16	2.75	113.91
9	53.375368	-1.291759	116.60	2.75	119.35
10	53.374132	-1.290975	121.61	2.75	124.36
11	53.373499	-1.289645	121.92	2.75	124.67
12	53.372282	-1.291877	120.46	2.75	123.21
13	53.370964	-1.293936	113.46	2.75	116.21
14	53.370695	-1.294473	112.20	2.75	114.95
15	53.369107	-1.295846	106.49	2.75	109.24
16	53.367315	-1.296640	90.34	2.75	93.09

Name: PRoW 7C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.373492	-1.289613	121.96	2.75	124.71
2	53.371834	-1.287918	120.45	2.75	123.20
3	53.371273	-1.285253	119.12	2.75	121.87
4	53.370543	-1.283032	114.16	2.75	116.91
5	53.369128	-1.283601	115.43	2.75	118.18
6	53.368232	-1.286734	106.30	2.75	109.05
7	53.367688	-1.289952	104.57	2.75	107.32
8	53.367118	-1.290435	102.84	2.75	105.59
9	53.367304	-1.292162	104.15	2.75	106.90
10	53.367067	-1.292323	104.59	2.75	107.34
11	53.366465	-1.294276	100.79	2.75	103.54
12	53.365947	-1.296036	89.90	2.75	92.65

Name: PRoW 9C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.388807	-1.276975	107.74	2.75	110.49
2	53.390266	-1.275377	116.85	2.75	119.60
3	53.391354	-1.274583	115.23	2.75	117.98
4	53.392089	-1.276010	100.64	2.75	103.39
5	53.392409	-1.275977	97.18	2.75	99.93
6	53.393926	-1.277544	83.36	2.75	86.11
7	53.393894	-1.278402	81.90	2.75	84.65
8	53.394149	-1.279089	80.57	2.75	83.32
9	53.394744	-1.279743	83.95	2.75	86.70
10	53.395248	-1.279748	84.23	2.75	86.98
11	53.395411	-1.282773	93.53	2.75	96.28
12	53.396345	-1.283514	97.97	2.75	100.72
13	53.397094	-1.283964	99.53	2.75	102.28
14	53.397254	-1.284919	97.83	2.75	100.58

Name: Route 1C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.398156	-1.308463	88.31	1.50	89.81
2	53.398028	-1.305395	91.71	1.50	93.21
3	53.397888	-1.302391	93.92	1.50	95.42
4	53.397734	-1.299387	96.04	1.50	97.54
5	53.397517	-1.296340	96.39	1.50	97.89
6	53.397024	-1.293336	94.38	1.50	95.88
7	53.396276	-1.290589	90.04	1.50	91.54
8	53.395316	-1.288036	85.16	1.50	86.66
9	53.394132	-1.285707	84.49	1.50	85.99
10	53.392757	-1.283714	86.35	1.50	87.85
11	53.391240	-1.282083	94.10	1.50	95.60
12	53.389619	-1.280799	102.06	1.50	103.56
13	53.387904	-1.279876	107.43	1.50	108.93
14	53.386145	-1.279071	110.41	1.50	111.91
15	53.384398	-1.278395	111.76	1.50	113.26
16	53.382606	-1.278116	113.40	1.50	114.90
17	53.380813	-1.278347	114.48	1.50	115.98
18	53.379015	-1.278809	112.59	1.50	114.09
19	53.377434	-1.279356	111.36	1.50	112.86
20	53.375667	-1.280107	110.69	1.50	112.19
21	53.373952	-1.281008	108.71	1.50	110.21
22	53.372198	-1.281759	109.89	1.50	111.39
23	53.370451	-1.282403	109.06	1.50	110.56
24	53.368665	-1.282800	107.68	1.50	109.18
25	53.366872	-1.283090	103.47	1.50	104.97
26	53.365080	-1.283251	100.39	1.50	101.89
27	53.363274	-1.283411	97.49	1.50	98.99
28	53.361418	-1.283647	100.17	1.50	101.67
29	53.359586	-1.283969	93.88	1.50	95.38
30	53.357804	-1.284500	93.06	1.50	94.56

Name: Route 1C - Part 2
Path type: One-way (toward increasing index)
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395790	-1.270344	100.16	1.50	101.66
2	53.395246	-1.273273	93.78	1.50	95.28
3	53.395047	-1.276224	90.64	1.50	92.14
4	53.394862	-1.279206	87.86	1.50	89.36
5	53.394836	-1.282200	89.33	1.50	90.83
6	53.394836	-1.285193	91.10	1.50	92.60
7	53.394990	-1.288187	89.56	1.50	91.06
8	53.395566	-1.291062	93.26	1.50	94.76
9	53.396493	-1.293647	95.43	1.50	96.93
10	53.397280	-1.296340	97.44	1.50	98.94
11	53.397555	-1.298239	96.46	1.50	97.96

Name: Route 2C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.397977	-1.324224	71.53	1.50	73.03
2	53.396154	-1.324320	72.69	1.50	74.19
3	53.394369	-1.324428	62.24	1.50	63.74
4	53.392577	-1.324460	58.74	1.50	60.24
5	53.390824	-1.323913	62.55	1.50	64.05
6	53.389059	-1.323346	56.31	1.50	57.81
7	53.387274	-1.322831	48.55	1.50	50.05
8	53.385526	-1.322413	40.48	1.50	41.98
9	53.383741	-1.322059	47.51	1.50	49.01
10	53.382710	-1.321715	54.77	1.50	56.27
11	53.381194	-1.320160	62.49	1.50	63.99
12	53.380659	-1.319849	64.62	1.50	66.12
13	53.378931	-1.319356	71.70	1.50	73.20
14	53.376857	-1.318959	79.86	1.50	81.36

Name: Route 3C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.386100	-1.322435	43.20	1.50	44.70
2	53.385312	-1.321222	46.30	1.50	47.80
3	53.384340	-1.318412	55.66	1.50	57.16
4	53.384673	-1.316459	54.05	1.50	55.55
5	53.383994	-1.315204	56.43	1.50	57.93
6	53.383303	-1.315837	57.07	1.50	58.57
7	53.382177	-1.315418	57.53	1.50	59.03
8	53.381569	-1.313970	60.40	1.50	61.90
9	53.381479	-1.311567	73.27	1.50	74.77
10	53.381479	-1.308541	93.26	1.50	94.76
11	53.381620	-1.305440	102.77	1.50	104.27

Name: Route 4C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.375023	-1.318160	85.37	1.50	86.87
2	53.374658	-1.315360	93.77	1.50	95.27
3	53.374133	-1.314351	96.79	1.50	98.29
4	53.372507	-1.313536	100.74	1.50	102.24
5	53.371631	-1.313086	101.06	1.50	102.56
6	53.370216	-1.311584	101.50	1.50	103.00
7	53.368955	-1.309588	97.40	1.50	98.90
8	53.367899	-1.307496	98.25	1.50	99.75
9	53.366734	-1.305253	93.87	1.50	95.37
10	53.365460	-1.303096	95.70	1.50	97.20
11	53.364768	-1.302270	99.28	1.50	100.78
12	53.364209	-1.302175	98.21	1.50	99.71
13	53.363292	-1.299655	101.09	1.50	102.59
14	53.362709	-1.298303	102.85	1.50	104.35
15	53.363285	-1.295524	97.05	1.50	98.55
16	53.363465	-1.294409	95.74	1.50	97.24
17	53.362856	-1.292005	98.03	1.50	99.53
18	53.362575	-1.290203	102.03	1.50	103.53
19	53.362555	-1.288518	102.23	1.50	103.73

Name: Route 5C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361239	-1.288554	99.41	1.50	100.91
2	53.362077	-1.286397	100.76	1.50	102.26
3	53.362865	-1.284777	101.75	1.50	103.25
4	53.362756	-1.282427	103.42	1.50	104.92
5	53.362730	-1.280421	103.41	1.50	104.91
6	53.363038	-1.277889	109.51	1.50	111.01
7	53.363089	-1.274070	117.74	1.50	119.24
8	53.362999	-1.272696	119.29	1.50	120.79

Name: Route 6C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381631	-1.278500	113.32	1.50	114.82
2	53.383417	-1.278747	114.72	1.50	116.22
3	53.384869	-1.278961	114.64	1.50	116.14
4	53.386584	-1.278017	120.39	1.50	121.89
5	53.388197	-1.276644	114.06	1.50	115.56
6	53.389803	-1.275249	115.49	1.50	116.99
7	53.391402	-1.273962	115.60	1.50	117.10
8	53.393008	-1.272664	113.22	1.50	114.72
9	53.394569	-1.271237	108.46	1.50	109.96
10	53.396118	-1.269660	105.31	1.50	106.81

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.396201	-1.285586	96.11	2.00
OP 2	2	53.383382	-1.274777	112.23	2.00
OP 3	3	53.382338	-1.273393	111.90	2.00
OP 4	4	53.380284	-1.265014	110.35	2.00
OP 5	5	53.381975	-1.276719	110.58	2.00
OP 6	6	53.381063	-1.279603	109.36	2.00
OP 7	7	53.372900	-1.269771	112.61	2.00
OP 8	8	53.371815	-1.272362	110.94	2.00
OP 9	9	53.371549	-1.277909	110.70	2.00
OP 10	10	53.366365	-1.278434	119.59	2.00
OP 11	11	53.363861	-1.284726	99.47	2.00
OP 12	12	53.362856	-1.287087	101.71	2.00
OP 13	13	53.363914	-1.293270	92.51	2.00
OP 14	14	53.367221	-1.305635	97.11	2.00
OP 15	15	53.367916	-1.307024	100.18	2.00
OP 16	16	53.369009	-1.310120	99.62	2.00
OP 17	17	53.370860	-1.312596	103.87	2.00
OP 18	18	53.374243	-1.314985	97.71	2.00
OP 19	19	53.375129	-1.316777	92.83	2.00
OP 20	20	53.375715	-1.317255	88.30	2.00
OP 21	21	53.376659	-1.318413	78.14	2.00
OP 22	22	53.378540	-1.302605	104.79	2.00
OP 23	23	53.380072	-1.302100	108.18	2.00
OP 24	24	53.381583	-1.301328	112.57	2.00
OP 25	25	53.382543	-1.300448	107.55	2.00
OP 26	26	53.382997	-1.300657	106.97	2.00
OP 27	27	53.383455	-1.297516	103.14	2.00
OP 28	28	53.382571	-1.301419	110.14	2.00
OP 29	29	53.383085	-1.302741	111.42	2.00
OP 30	30	53.383037	-1.304045	113.08	2.00
OP 31	31	53.382317	-1.310813	84.32	2.00
OP 32	32	53.387979	-1.321788	61.15	2.00
OP 33	33	53.393621	-1.325844	56.06	2.00
OP 34	34	53.395264	-1.312093	103.39	2.00
OP 35	35	53.395741	-1.323204	75.78	2.00
OP 36	36	53.397398	-1.321887	78.72	2.00
OP 37	37	53.396755	-1.312789	92.19	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	239,121	3,985.3	188,802	3,146.7	-
PV array 2	8.0	180.0	148,091	2,468.2	200,186	3,336.4	-
PV array 3	8.0	180.0	33,385	556.4	38,892	648.2	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1C	83,181	1,386.3	60,473	1,007.9
PRoW 2C	127,225	2,120.4	96,131	1,602.2
PRoW 3C	2,692	44.9	10,336	172.3
PRoW 4C	0	0.0	0	0.0
PRoW 5C	5,199	86.7	3,687	61.5
PRoW 6C	18,187	303.1	26,291	438.2
PRoW 7C	95,675	1,594.6	97,387	1,623.1
PRoW 9C	2,759	46.0	1,581	26.4
Route 1C	7,790	129.8	8,654	144.2
Route 1C - Part 2	5,939	99.0	13,639	227.3
Route 2C	0	0.0	0	0.0
Route 3C	1,667	27.8	4,908	81.8
Route 4C	3,791	63.2	5,455	90.9
Route 5C	110	1.8	0	0.0
Route 6C	1,578	26.3	10,106	168.4
OP 1	821	13.7	404	6.7
OP 2	2,101	35.0	4,587	76.5
OP 3	2,440	40.7	3,347	55.8
OP 4	2,228	37.1	2,862	47.7
OP 5	2,217	37.0	3,393	56.5
OP 6	2,542	42.4	3,122	52.0
OP 7	2,213	36.9	1,286	21.4
OP 8	3,041	50.7	1,057	17.6
OP 9	3,392	56.5	1,592	26.5
OP 10	744	12.4	190	3.2
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	1,076	17.9	0	0.0
OP 15	1,313	21.9	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 16	1,876	31.3	71	1.2
OP 17	3,313	55.2	2,498	41.6
OP 18	3,683	61.4	5,503	91.7
OP 19	4,588	76.5	2,398	40.0
OP 20	2,222	37.0	695	11.6
OP 21	2,119	35.3	459	7.7
OP 22	8,896	148.3	17,498	291.6
OP 23	924	15.4	3,450	57.5
OP 24	1,148	19.1	4,518	75.3
OP 25	1,090	18.2	3,727	62.1
OP 26	920	15.3	3,429	57.1
OP 27	1,112	18.5	4,057	67.6
OP 28	1,008	16.8	3,761	62.7
OP 29	956	15.9	3,459	57.6
OP 30	928	15.5	3,405	56.8
OP 31	760	12.7	59	1.0
OP 32	627	10.4	2,048	34.1
OP 33	652	10.9	0	0.0
OP 34	1,577	26.3	5,379	89.7
OP 35	225	3.8	0	0.0
OP 36	0	0.0	0	0.0
OP 37	2,052	34.2	978	16.3

PV: PV array 1 potential temporary after-image

Receptor results ordered by category of glare

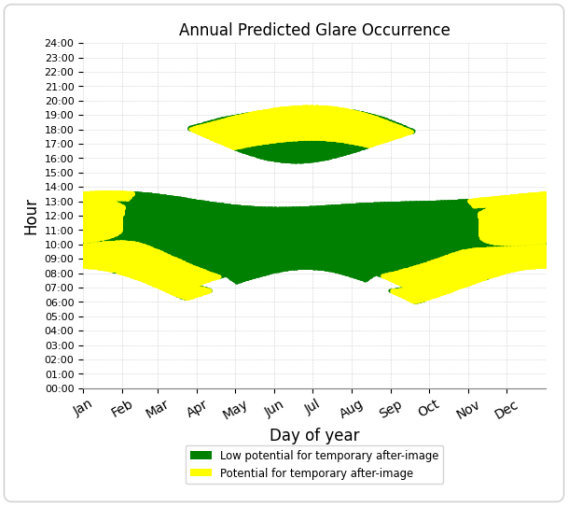
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1C	83,181	1,386.3	60,473	1,007.9
PRoW 2C	124,485	2,074.8	82,736	1,378.9
PRoW 3C	2,373	39.5	9,241	154.0
PRoW 9C	2,664	44.4	1,242	20.7
Route 1C	5,457	91.0	5,303	88.4
Route 1C - Part 2	5,939	99.0	13,639	227.3
Route 3C	730	12.2	826	13.8
Route 6C	74	1.2	157	2.6
PRoW 4C	0	0.0	0	0.0
PRoW 5C	0	0.0	0	0.0
PRoW 6C	0	0.0	0	0.0
PRoW 7C	0	0.0	0	0.0
Route 2C	0	0.0	0	0.0
Route 4C	0	0.0	0	0.0
Route 5C	0	0.0	0	0.0
OP 1	821	13.7	404	6.7
OP 2	1,590	26.5	2,010	33.5
OP 3	1,550	25.8	1,713	28.6
OP 4	1,561	26.0	1,415	23.6
OP 5	1,637	27.3	1,238	20.6
OP 32	627	10.4	2,048	34.1
OP 34	1,577	26.3	5,379	89.7
OP 37	2,052	34.2	978	16.3
OP 6	1,926	32.1	0	0.0
OP 33	652	10.9	0	0.0
OP 35	225	3.8	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0

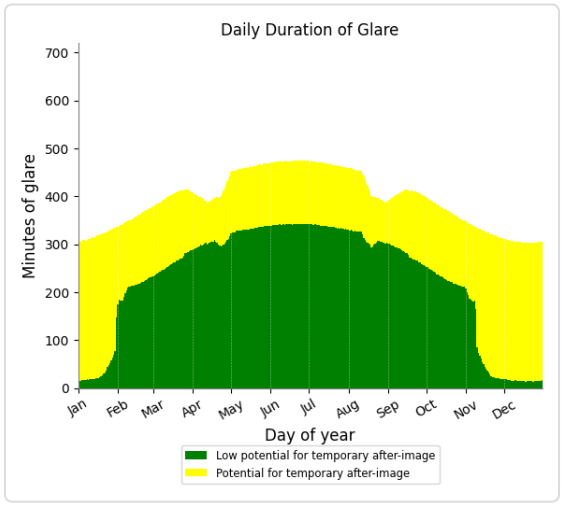
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 36	0	0.0	0	0.0

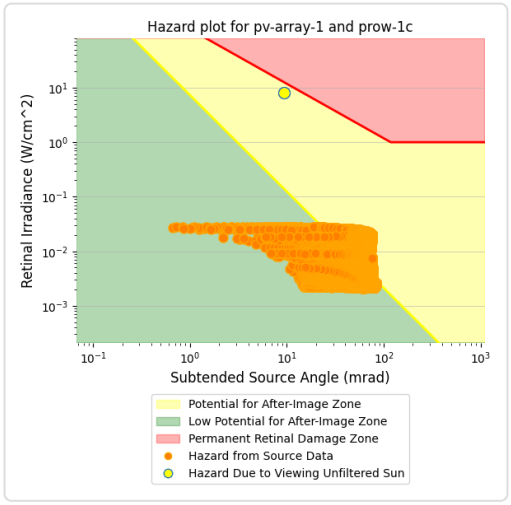
PV array 1 and Route: PRoW 1C

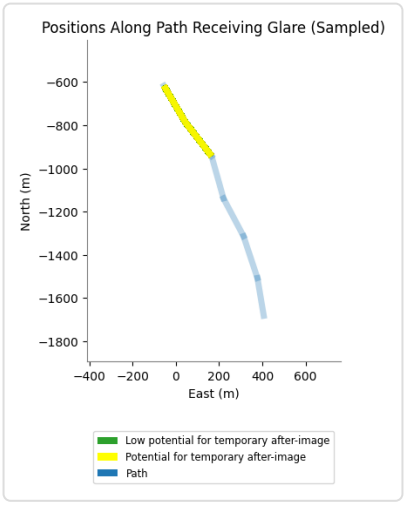
Yellow glare: 60,473 min.

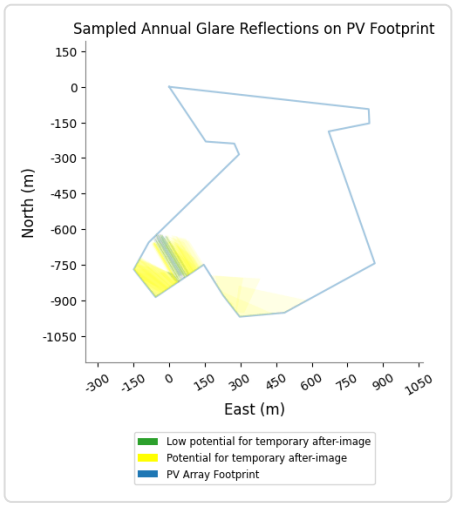
Green glare: 83,181 min.







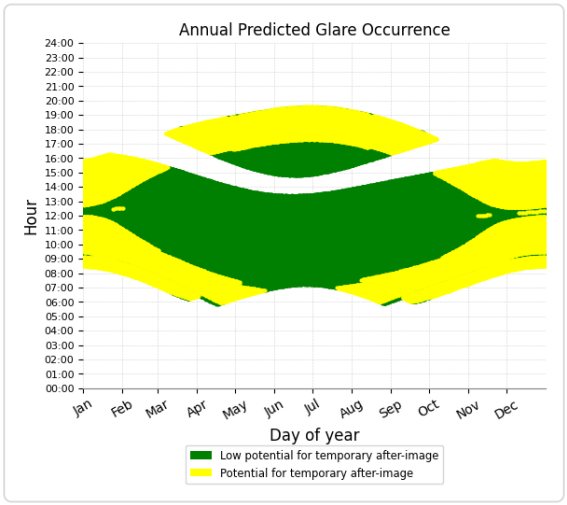


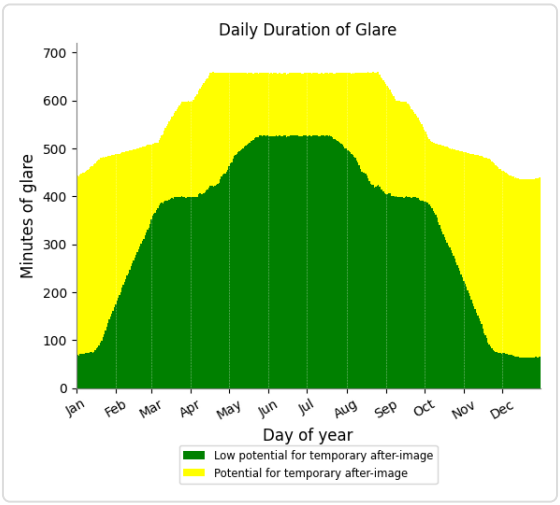


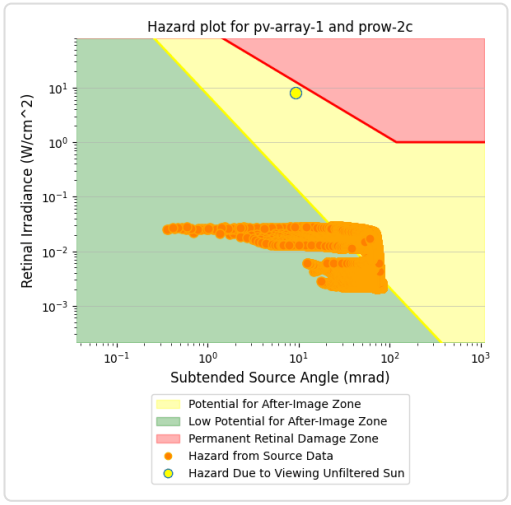
PV array 1 and Route: PRoW 2C

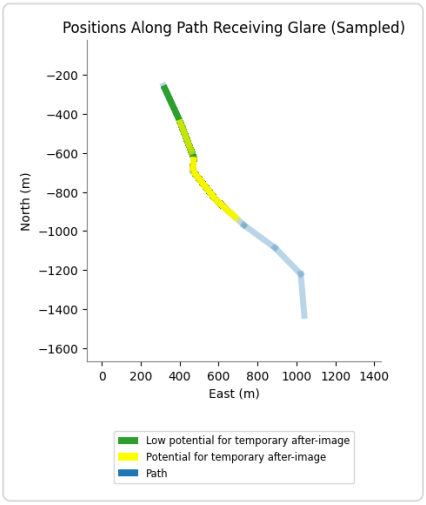
Yellow glare: 82,736 min.

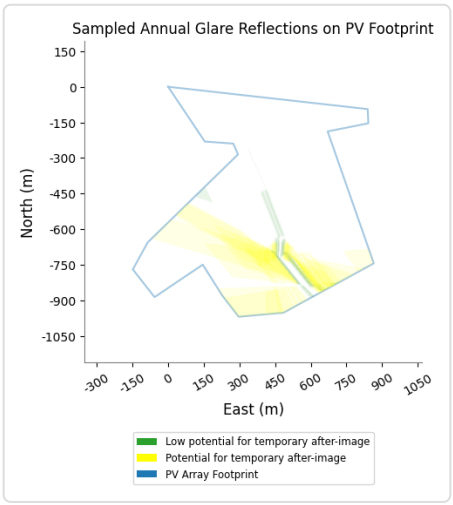
Green glare: 124,485 min.







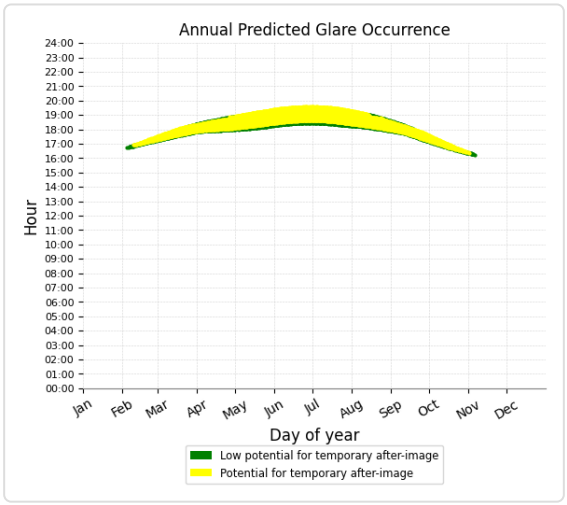


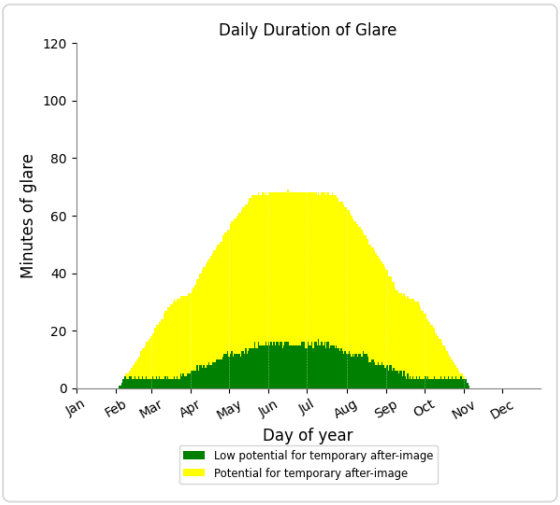


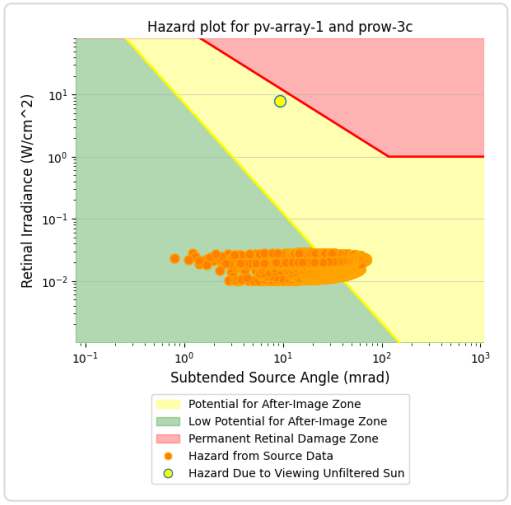
PV array 1 and Route: PRoW 3C

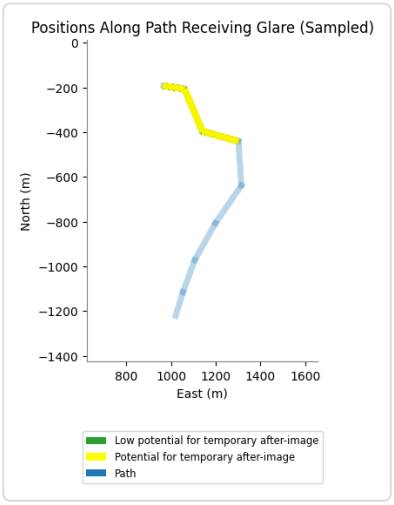
Yellow glare: 9,241 min.

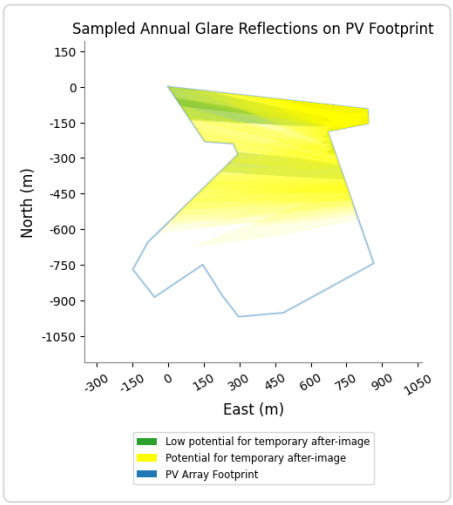
Green glare: 2,373 min.







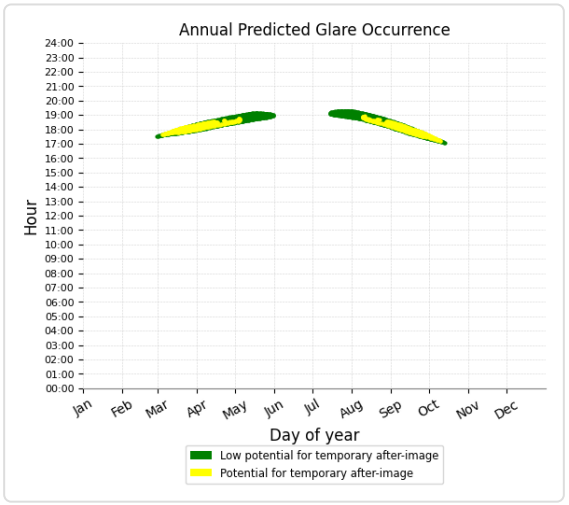


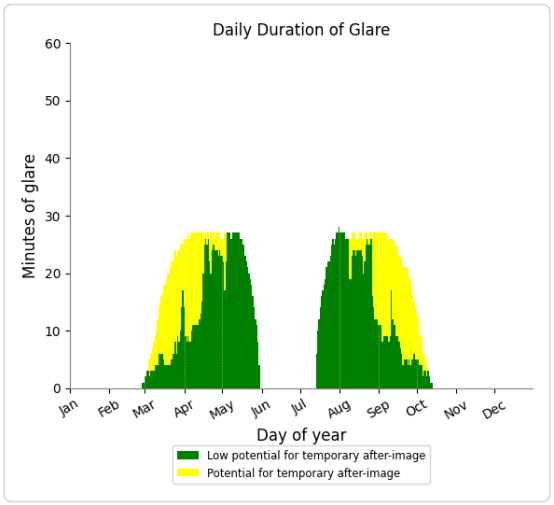


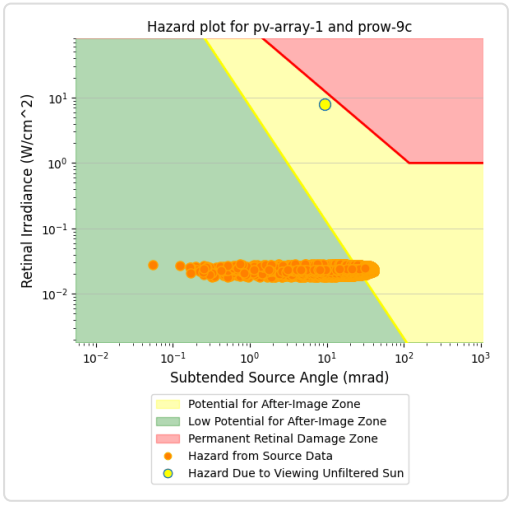
PV array 1 and Route: PRoW 9C

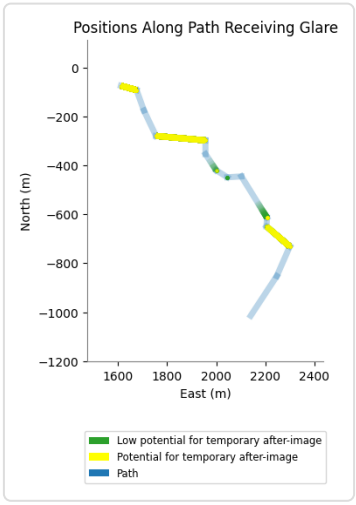
Yellow glare: 1,242 min.

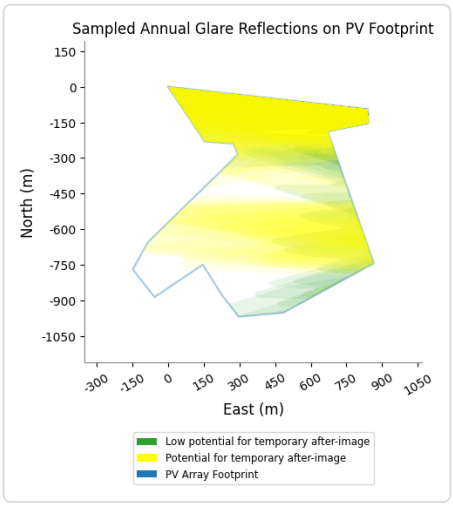
Green glare: 2,664 min.







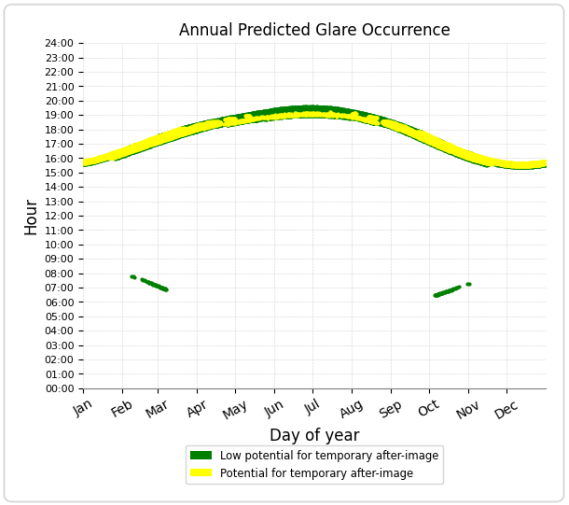


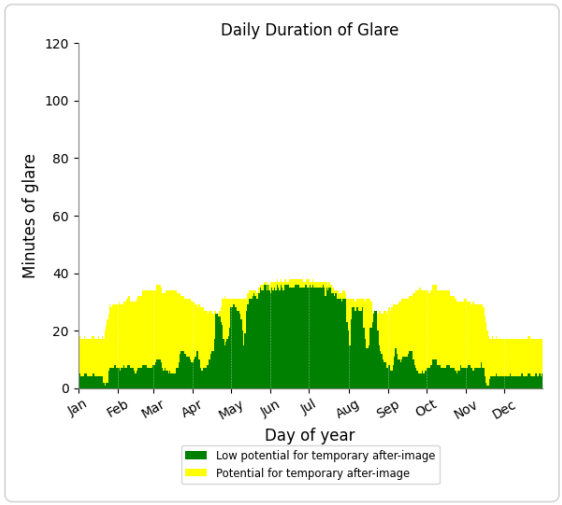


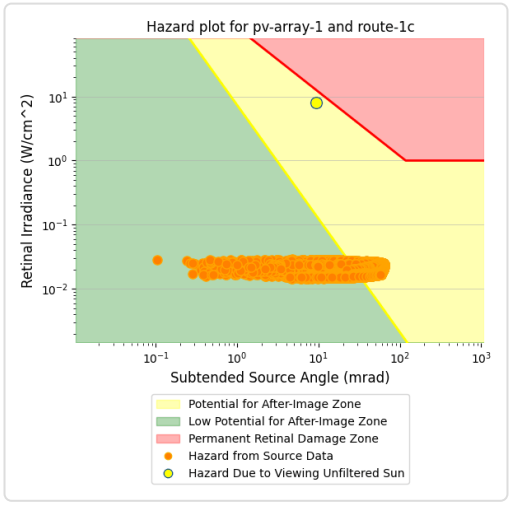
PV array 1 and Route: Route 1C

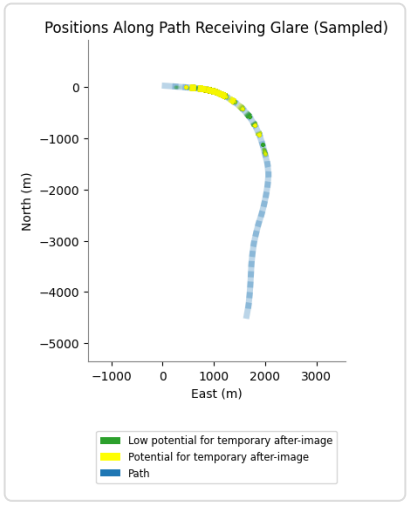
Yellow glare: 5,303 min.

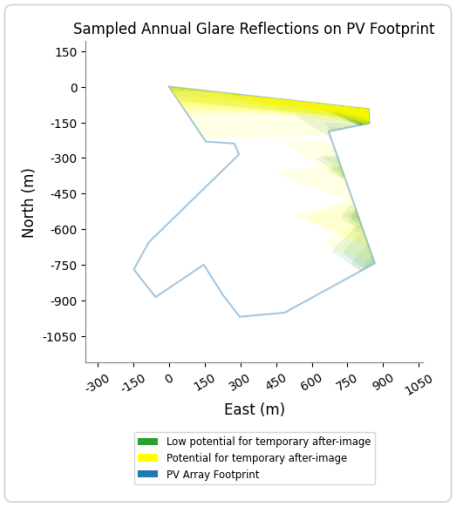
Green glare: 5,457 min.







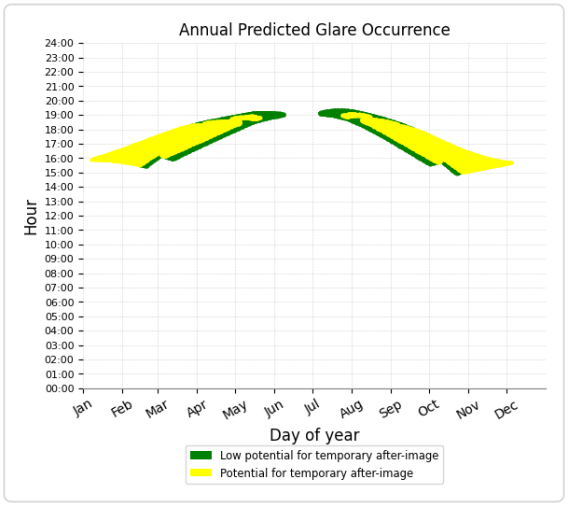


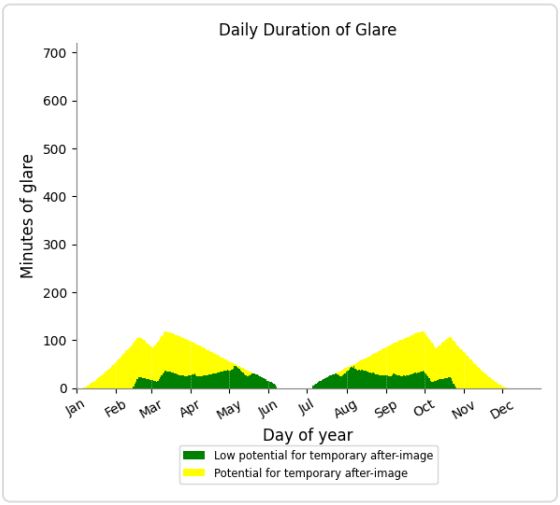


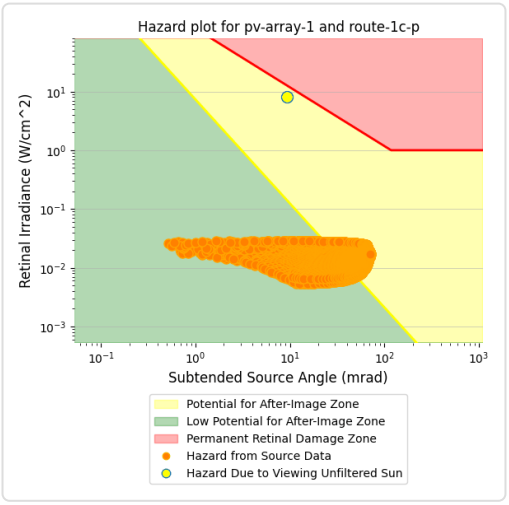
PV array 1 and Route: Route 1C - Part 2

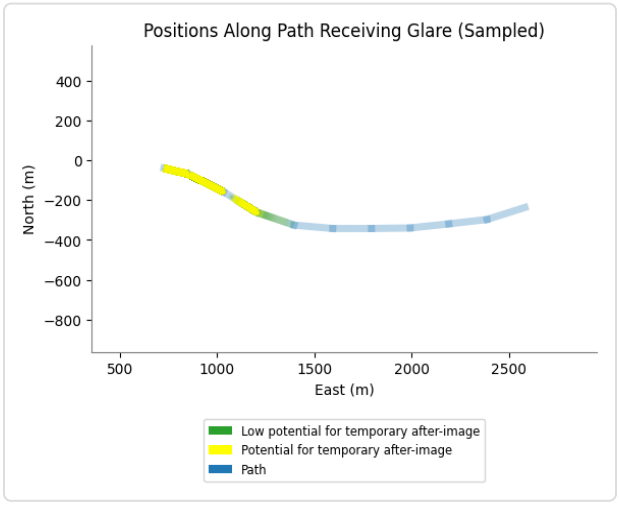
Yellow glare: 13,639 min.

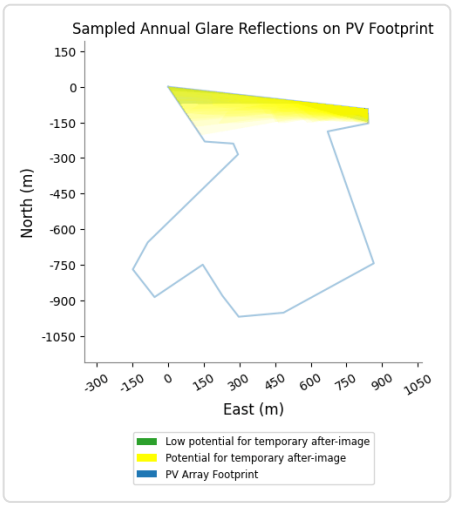
Green glare: 5,939 min.







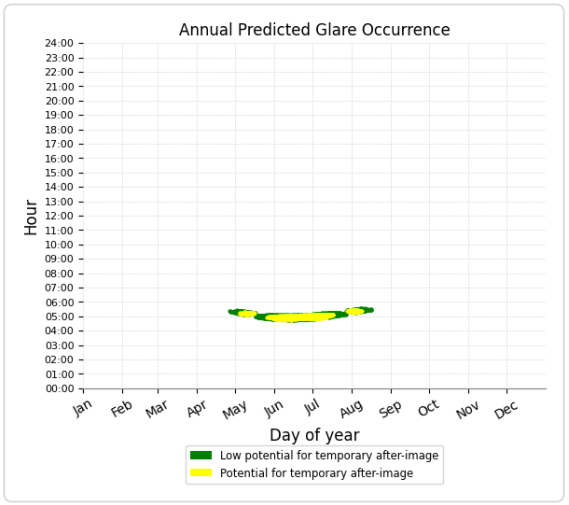


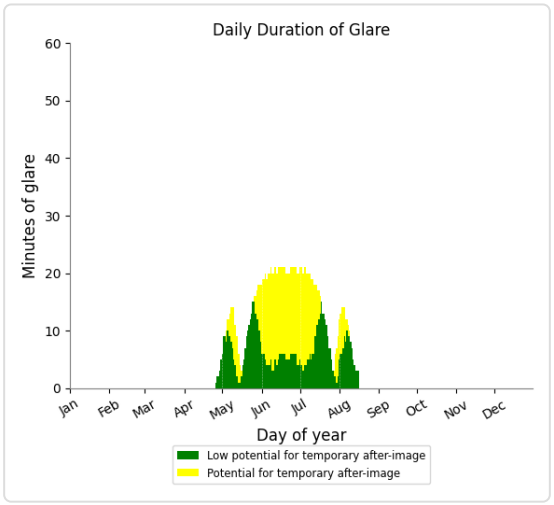


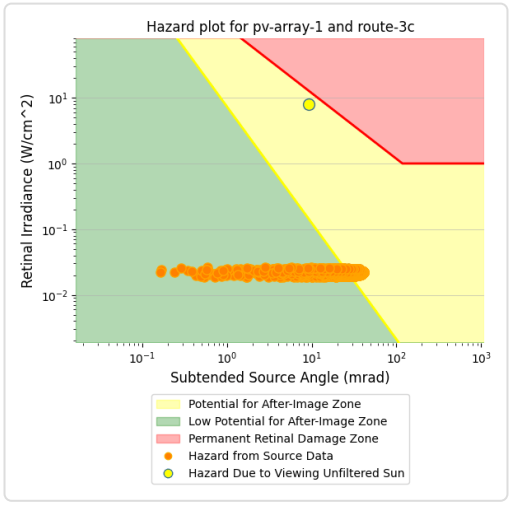
PV array 1 and Route: Route 3C

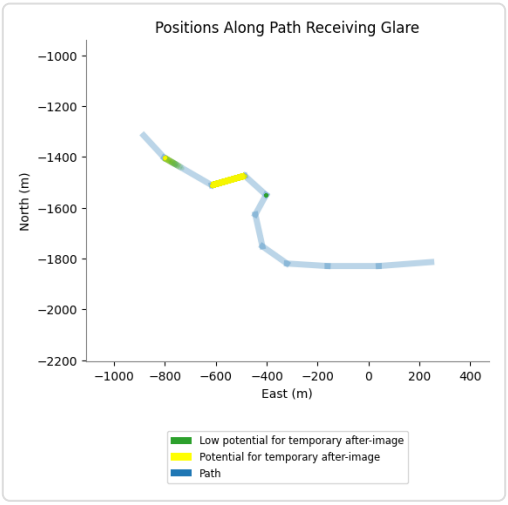
Yellow glare: 826 min.

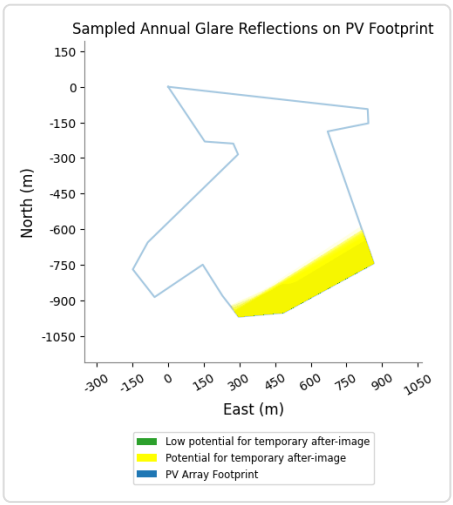
Green glare: 730 min.







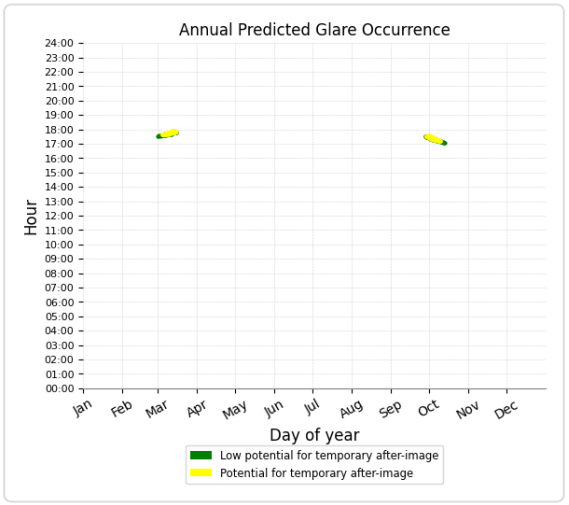


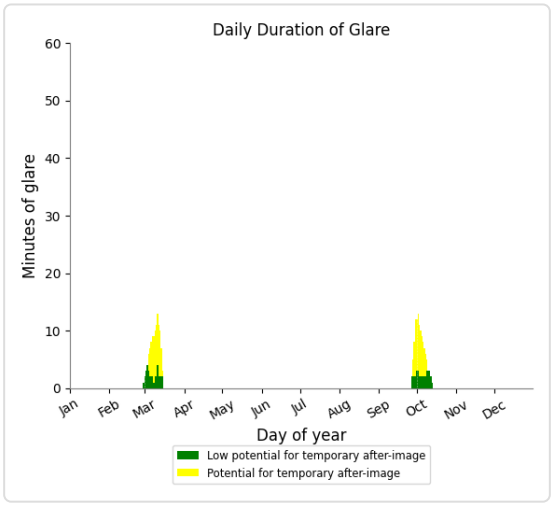


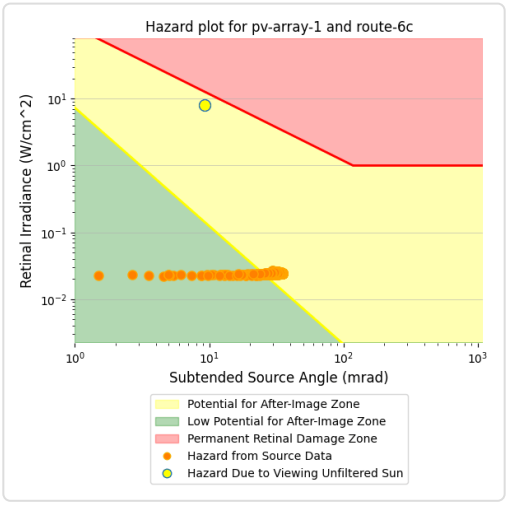
PV array 1 and Route: Route 6C

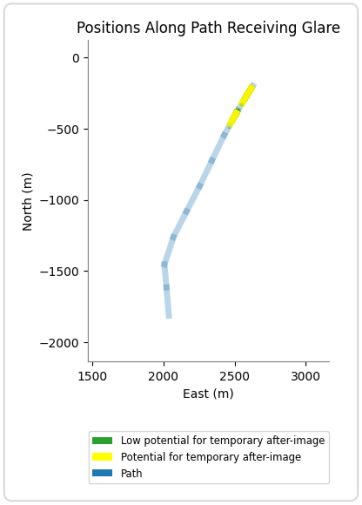
Yellow glare: 157 min.

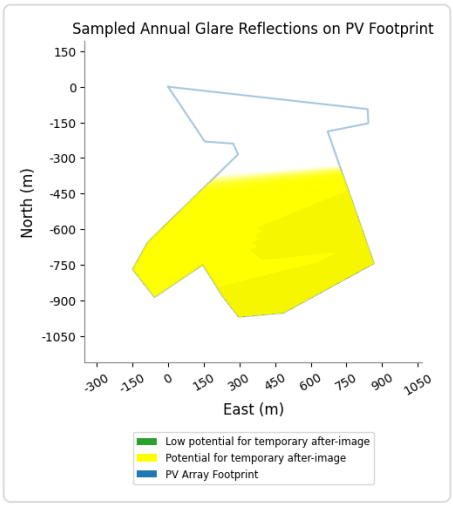
Green glare: 74 min.











PV array 1 and Route: PRoW 4C

No glare found

PV array 1 and Route: PRoW 5C

No glare found

PV array 1 and Route: PRoW 6C

No glare found

PV array 1 and Route: PRoW 7C

No glare found

PV array 1 and Route: Route 2C

No glare found

PV array 1 and Route: Route 4C

No glare found

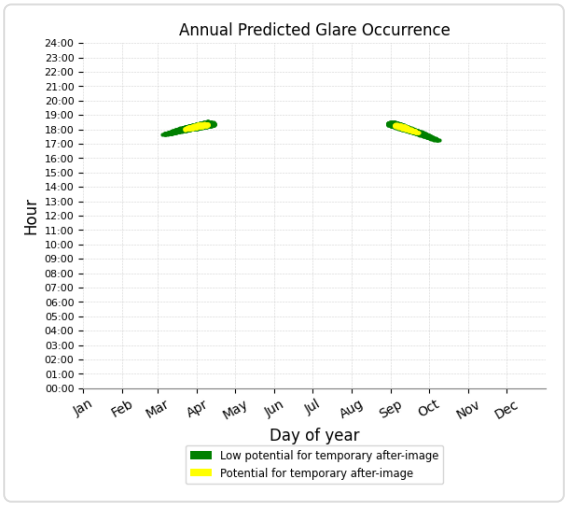
PV array 1 and Route: Route 5C

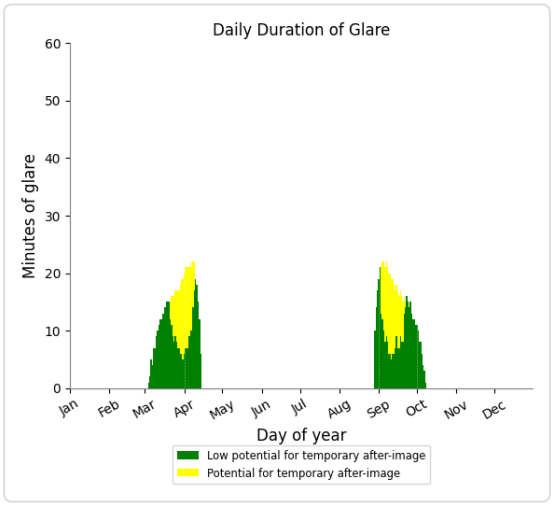
No glare found

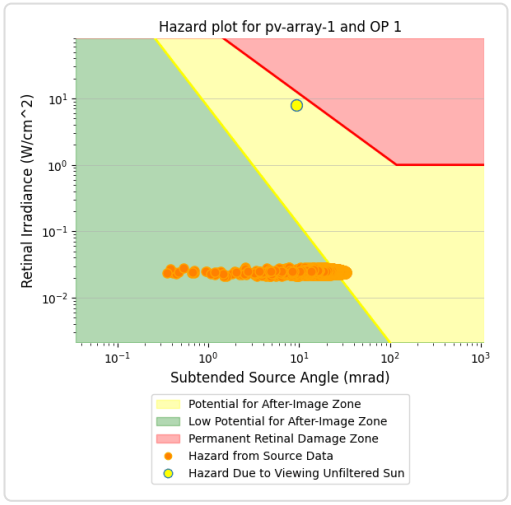
PV array 1 and OP 1

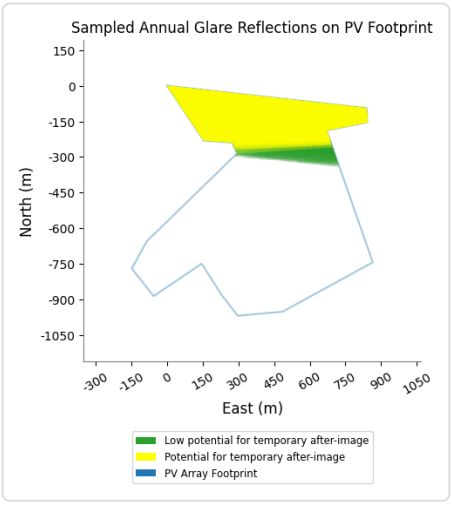
Yellow glare: 404 min.

Green glare: 821 min.





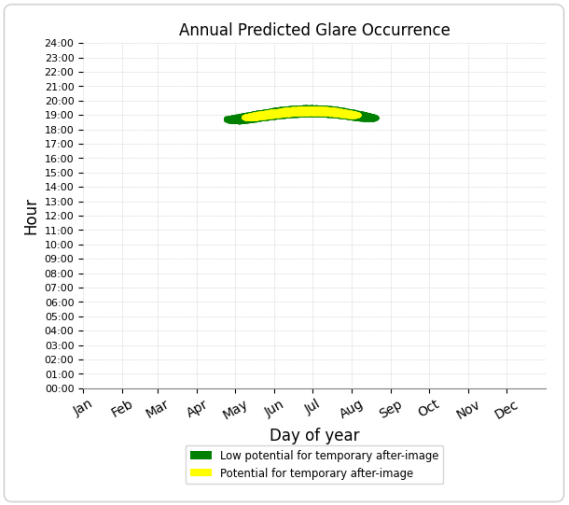


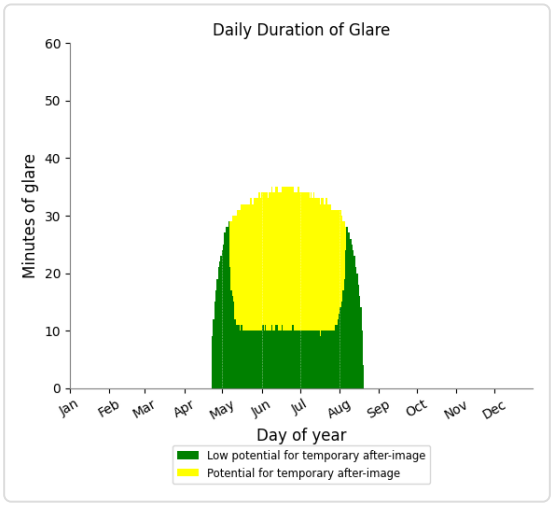


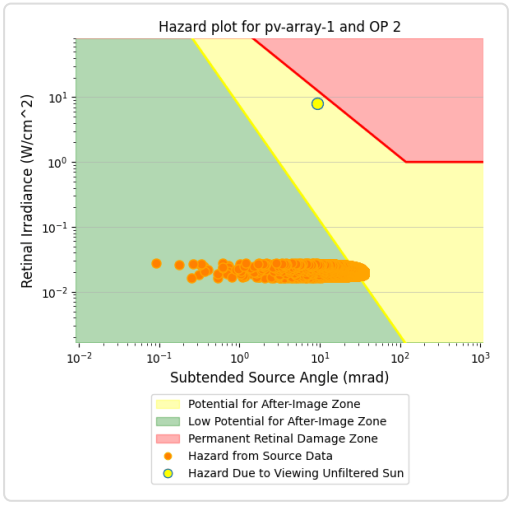
PV array 1 and OP 2

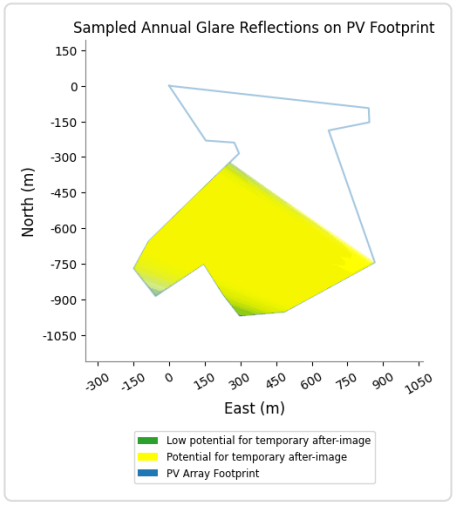
Yellow glare: 2,010 min.

Green glare: 1,590 min.





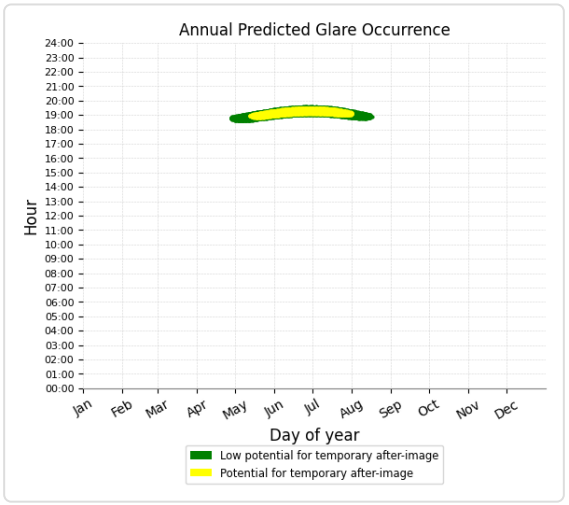


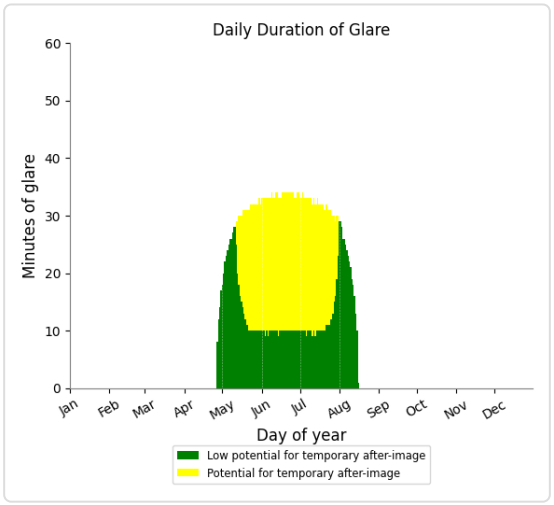


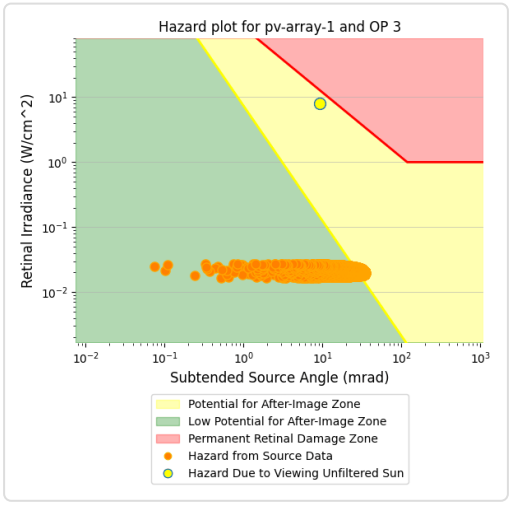
PV array 1 and OP 3

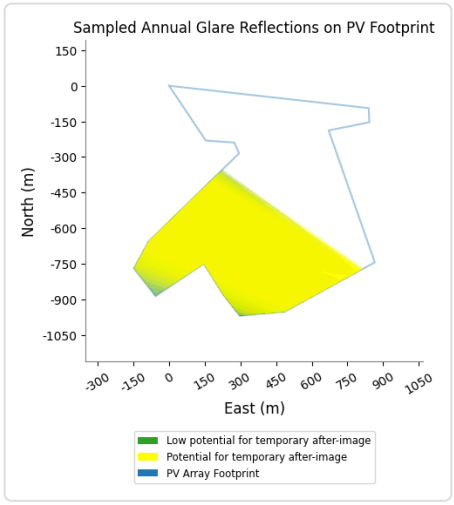
Yellow glare: 1,713 min.

Green glare: 1,550 min.





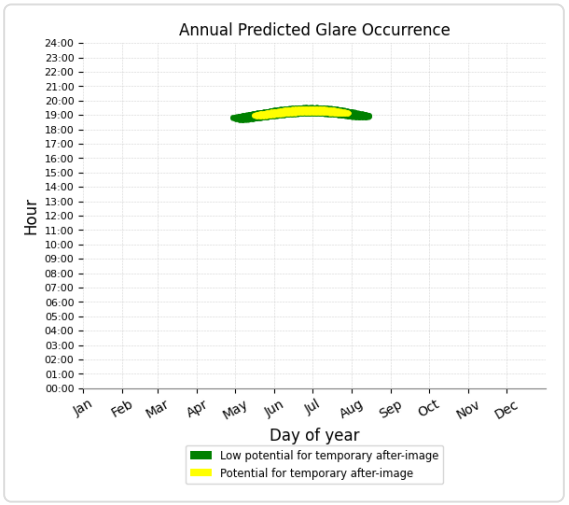


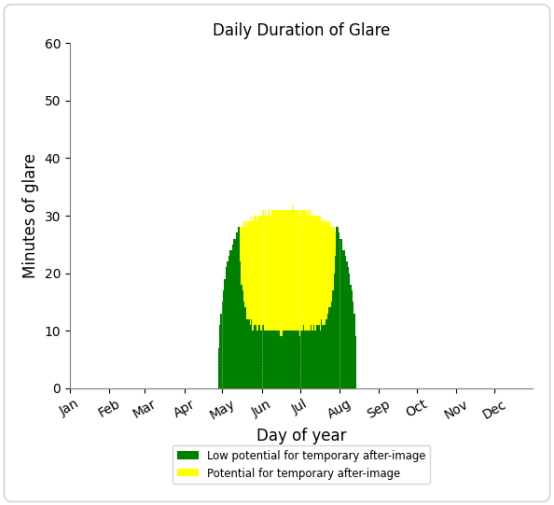


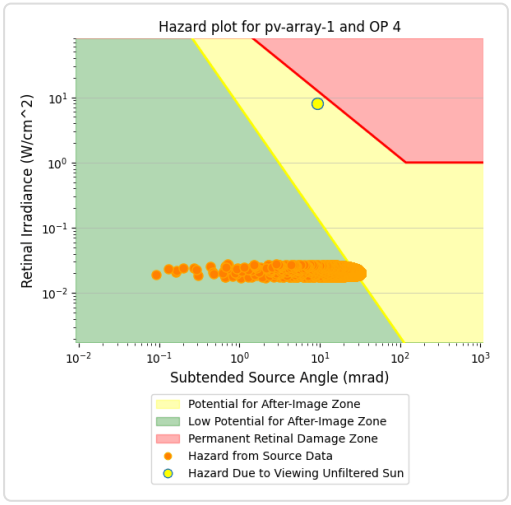
PV array 1 and OP 4

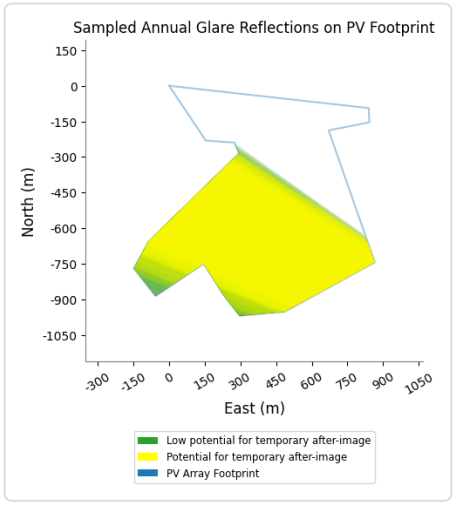
Yellow glare: 1,415 min.

Green glare: 1,561 min.





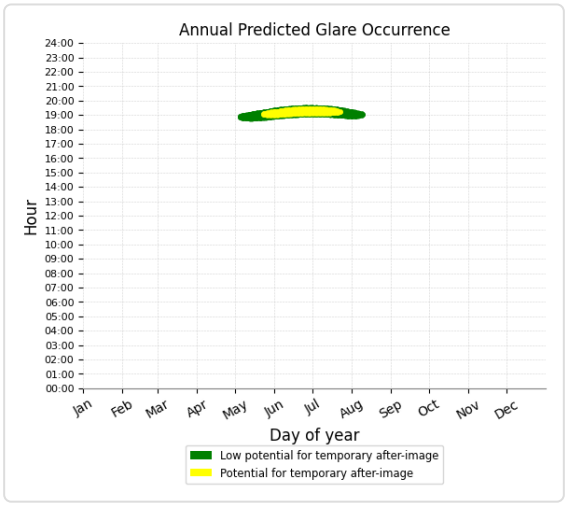


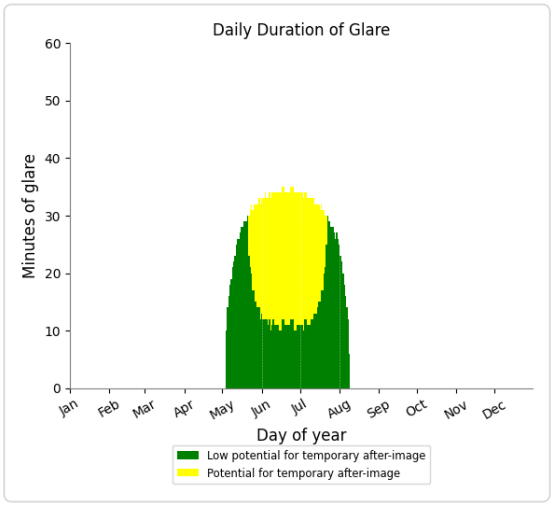


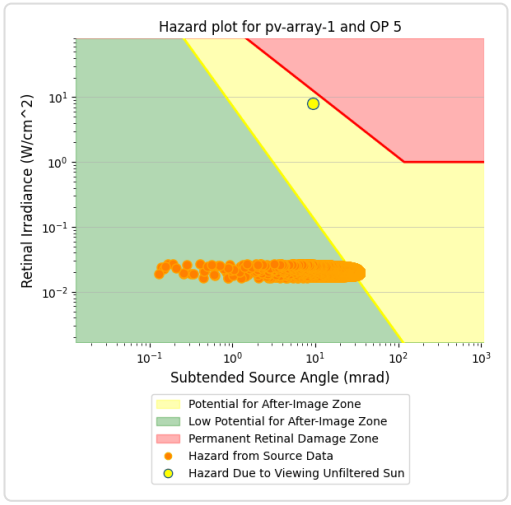
PV array 1 and OP 5

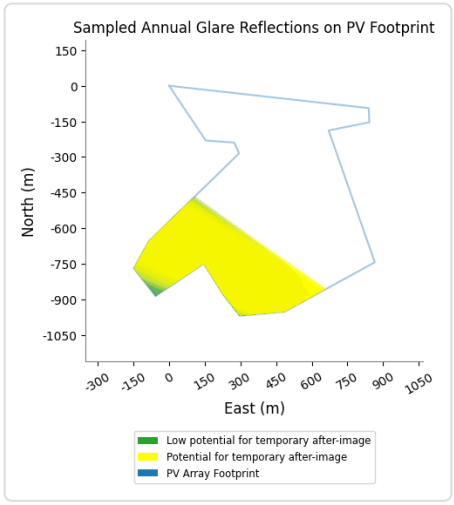
Yellow glare: 1,238 min.

Green glare: 1,637 min.





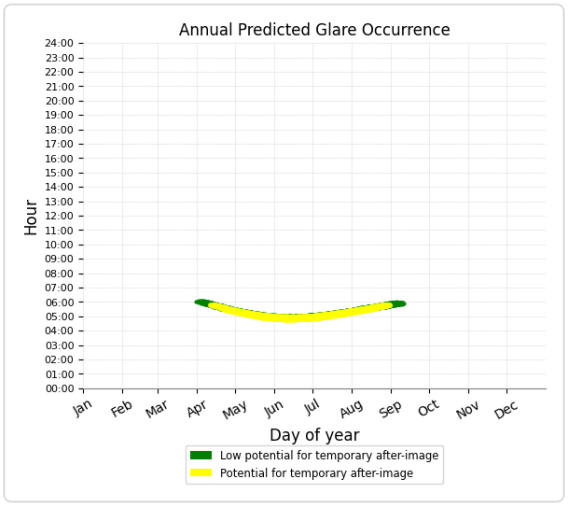


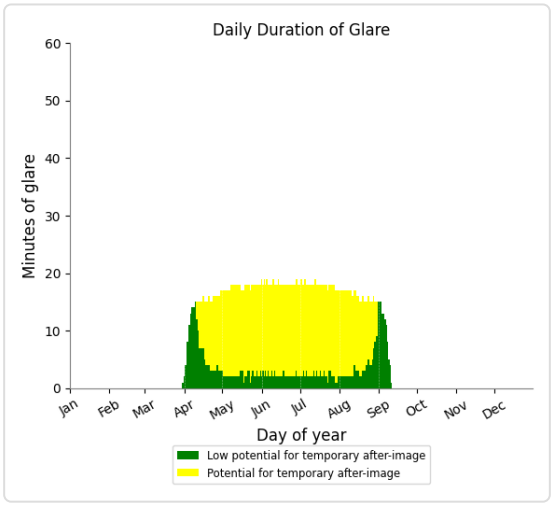


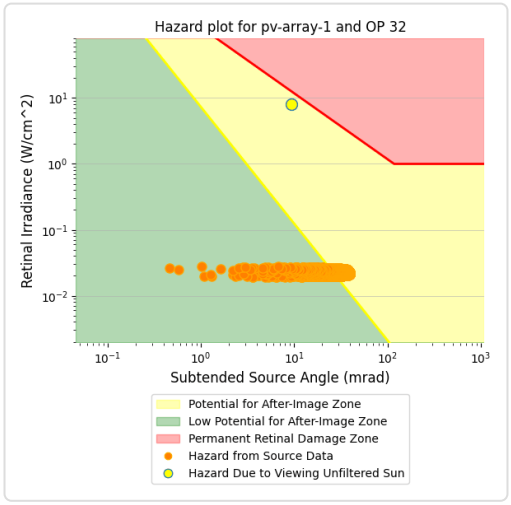
PV array 1 and OP 32

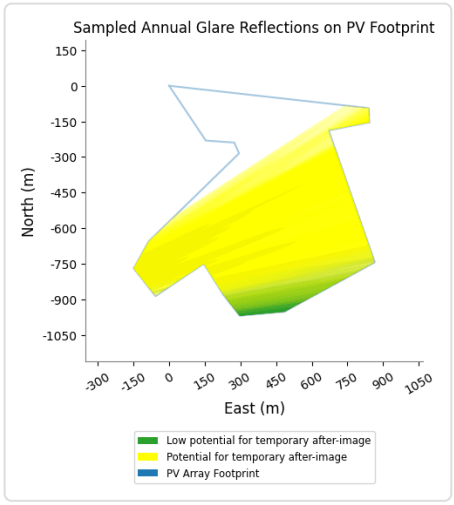
Yellow glare: 2,048 min.

Green glare: 627 min.





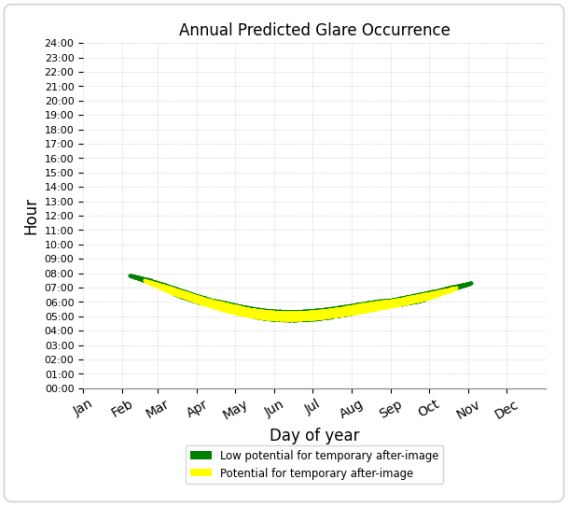


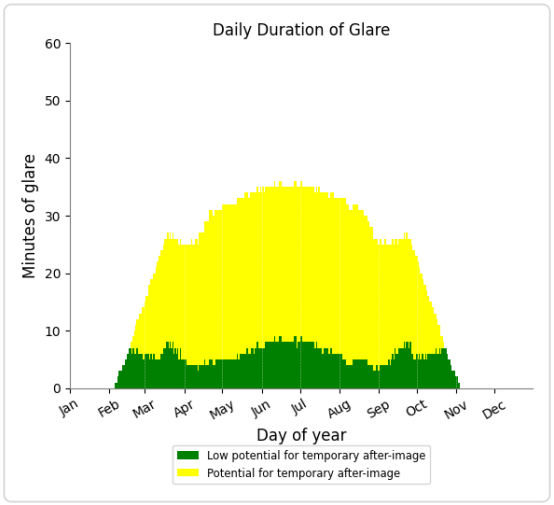


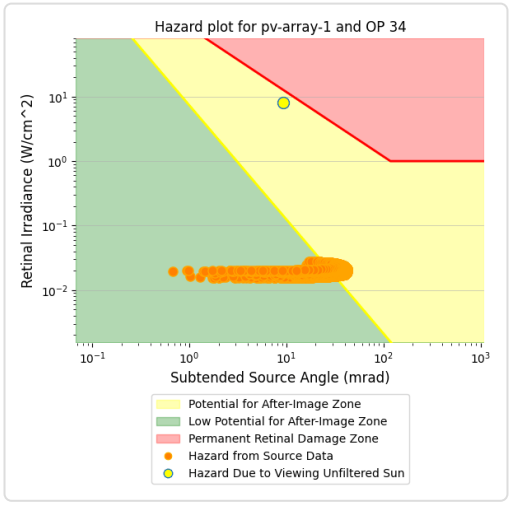
PV array 1 and OP 34

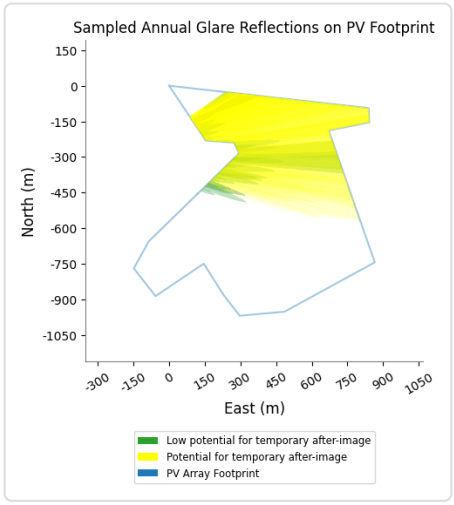
Yellow glare: 5,379 min.

Green glare: 1,577 min.





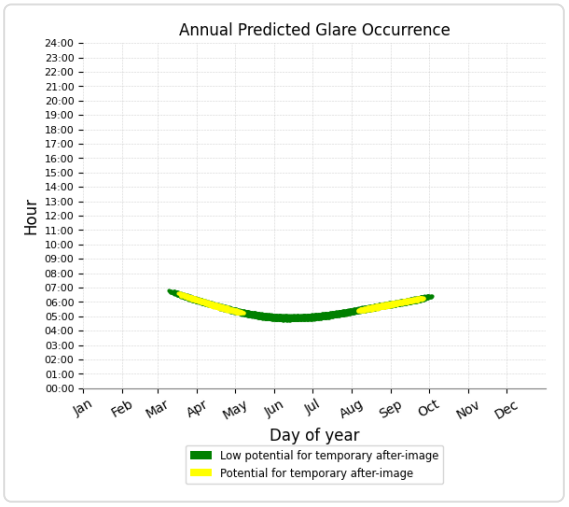


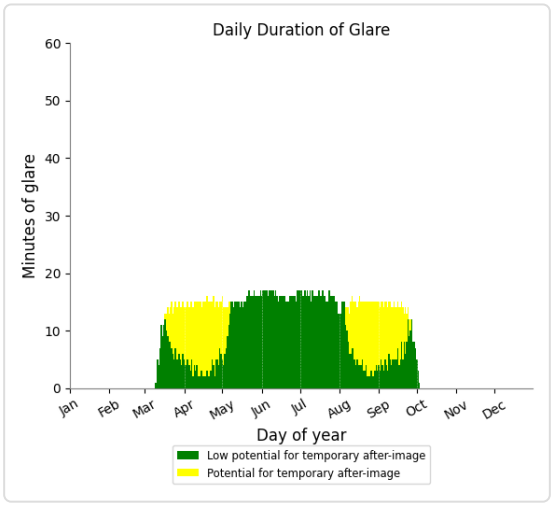


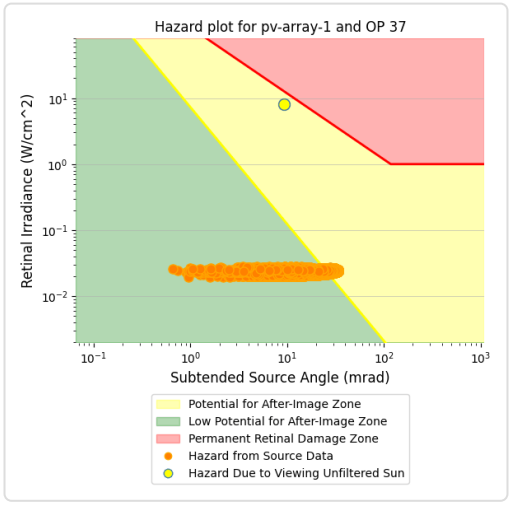
PV array 1 and OP 37

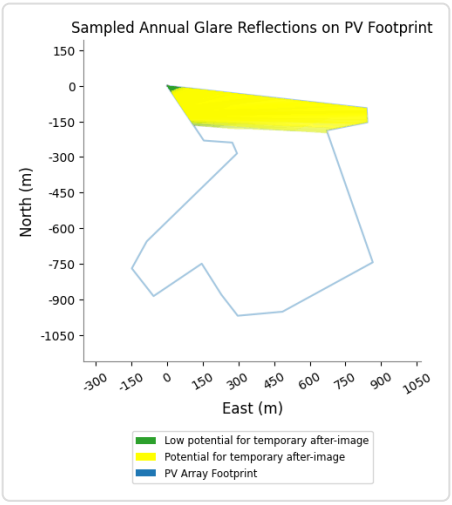
Yellow glare: 978 min.

Green glare: 2,052 min.





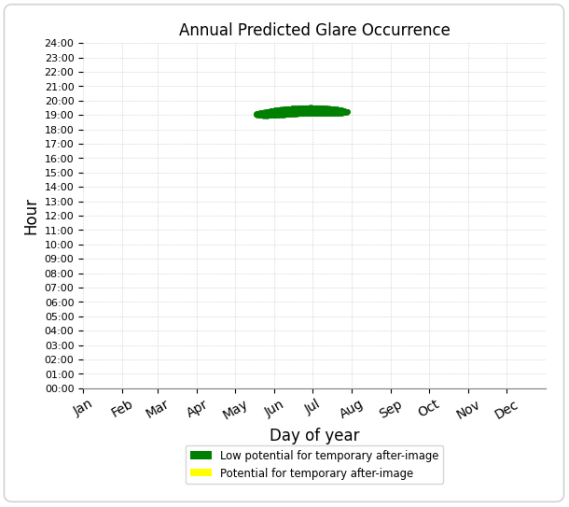


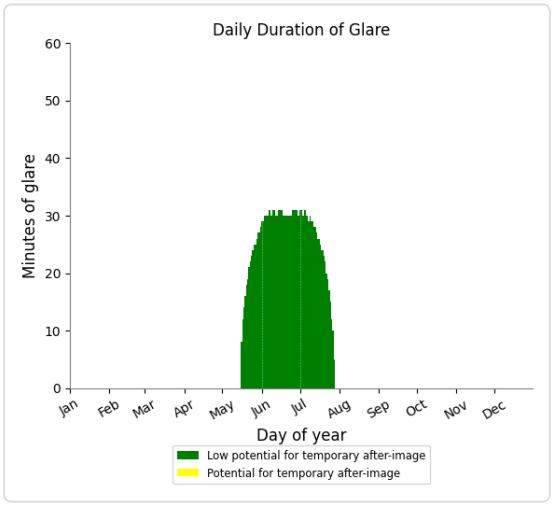


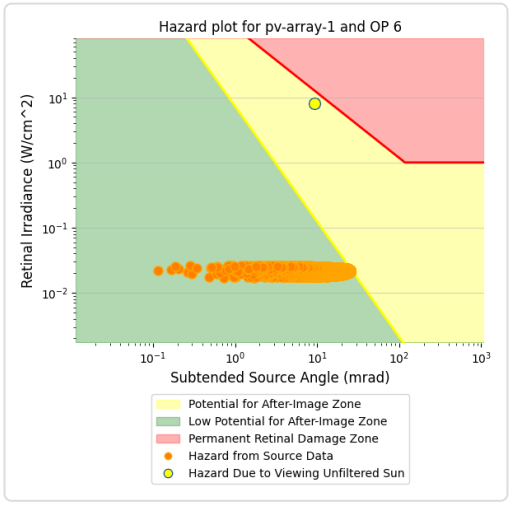
PV array 1 and OP 6

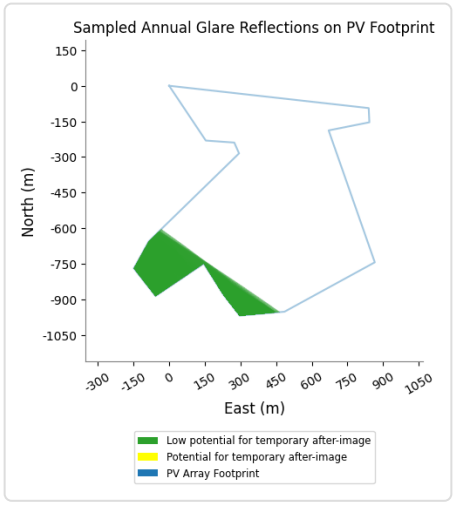
Yellow glare: none

Green glare: 1,926 min.





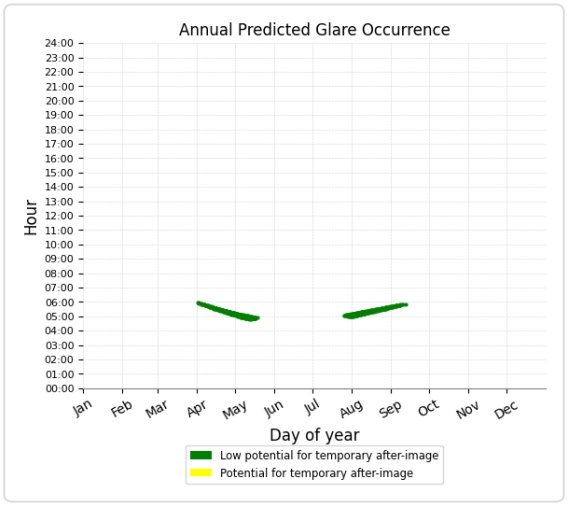


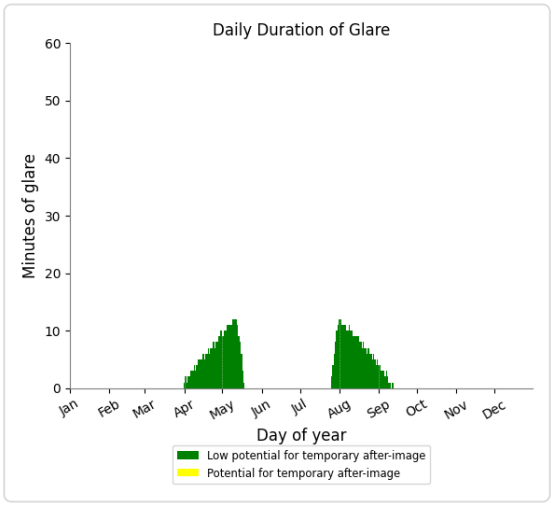


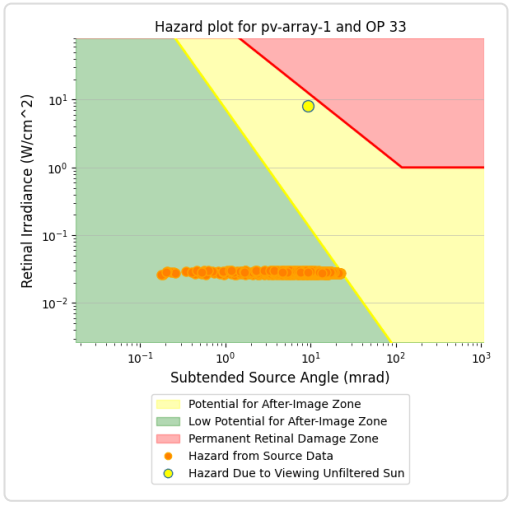
PV array 1 and OP 33

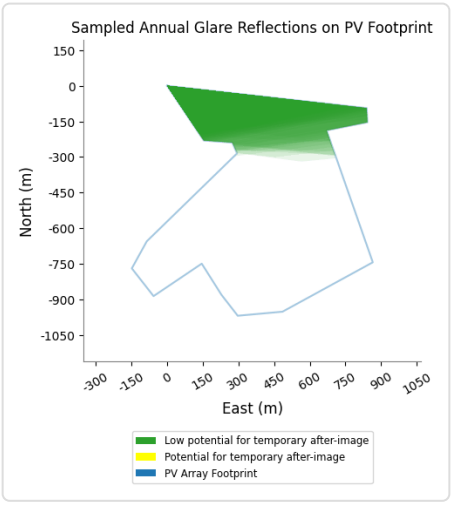
Yellow glare: none

Green glare: 652 min.



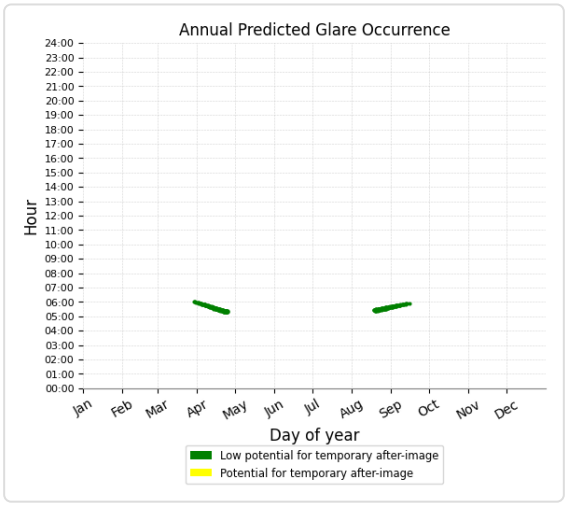


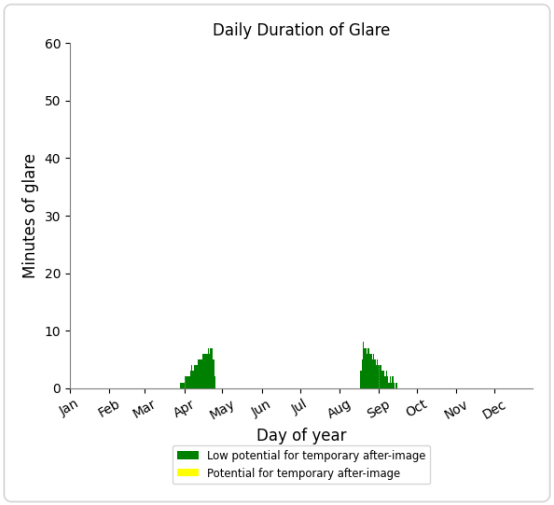


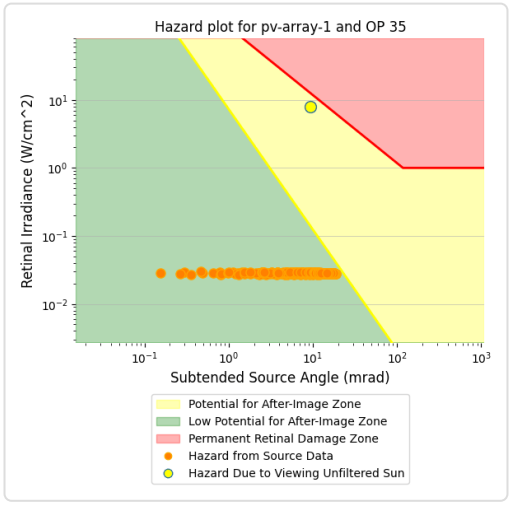


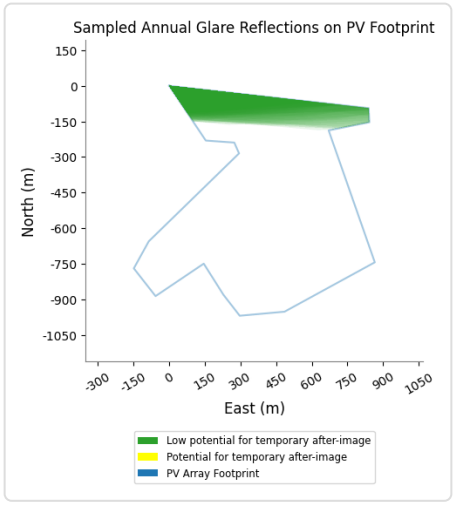
PV array 1 and OP 35

Yellow glare: none
Green glare: 225 min.









PV array 1 and OP 7

No glare found

PV array 1 and OP 8

No glare found

PV array 1 and OP 9

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 11

No glare found

PV array 1 and OP 12

No glare found

PV array 1 and OP 13

No glare found

PV array 1 and OP 14

No glare found

PV array 1 and OP 15

No glare found

PV array 1 and OP 16

No glare found

PV array 1 and OP 17

No glare found

PV array 1 and OP 18

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 22

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV array 1 and OP 26

No glare found

PV array 1 and OP 27

No glare found

PV array 1 and OP 28

No glare found

PV array 1 and OP 29

No glare found

PV array 1 and OP 30

No glare found

PV array 1 and OP 31

No glare found

PV array 1 and OP 36

No glare found

PV: PV array 2 potential temporary after-image

Receptor results ordered by category of glare

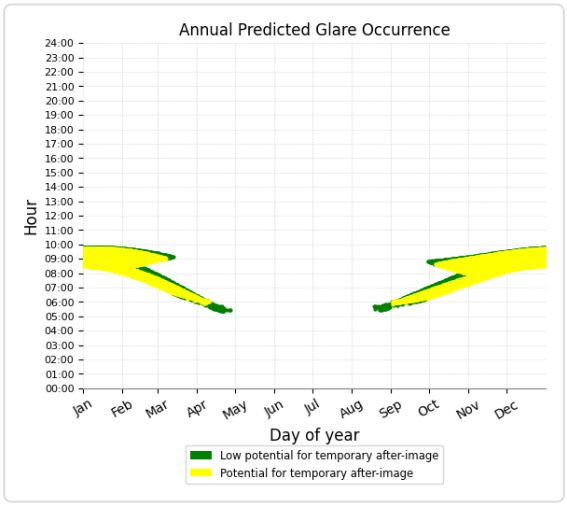
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2C	2,740	45.7	13,395	223.2
PRoW 3C	319	5.3	1,095	18.2
PRoW 5C	1,152	19.2	2,385	39.8
PRoW 6C	17,237	287.3	18,628	310.5
PRoW 7C	95,465	1,591.1	94,653	1,577.5
PRoW 9C	95	1.6	339	5.7
Route 1C	2,333	38.9	3,351	55.9
Route 3C	937	15.6	4,082	68.0
Route 4C	1,629	27.1	1,305	21.8
Route 6C	1,504	25.1	9,949	165.8
PRoW 1C	0	0.0	0	0.0
PRoW 4C	0	0.0	0	0.0
Route 1C - Part 2	0	0.0	0	0.0
Route 2C	0	0.0	0	0.0
Route 5C	0	0.0	0	0.0
OP 2	511	8.5	2,577	43.0
OP 3	890	14.8	1,634	27.2
OP 4	667	11.1	1,447	24.1
OP 5	580	9.7	2,155	35.9
OP 6	616	10.3	3,122	52.0
OP 7	821	13.7	1,286	21.4
OP 8	1,216	20.3	947	15.8
OP 9	1,144	19.1	1,069	17.8
OP 16	1,876	31.3	71	1.2
OP 17	1,504	25.1	959	16.0
OP 18	749	12.5	1,689	28.1
OP 19	998	16.6	932	15.5
OP 21	1,189	19.8	459	7.7
OP 22	684	11.4	2,792	46.5
OP 23	924	15.4	3,450	57.5
OP 24	1,148	19.1	4,518	75.3
OP 25	1,090	18.2	3,727	62.1
OP 26	920	15.3	3,429	57.1
OP 27	1,112	18.5	4,057	67.6
OP 28	1,008	16.8	3,761	62.7
OP 29	956	15.9	3,459	57.6
OP 30	928	15.5	3,405	56.8
OP 31	760	12.7	59	1.0
OP 14	1,076	17.9	0	0.0

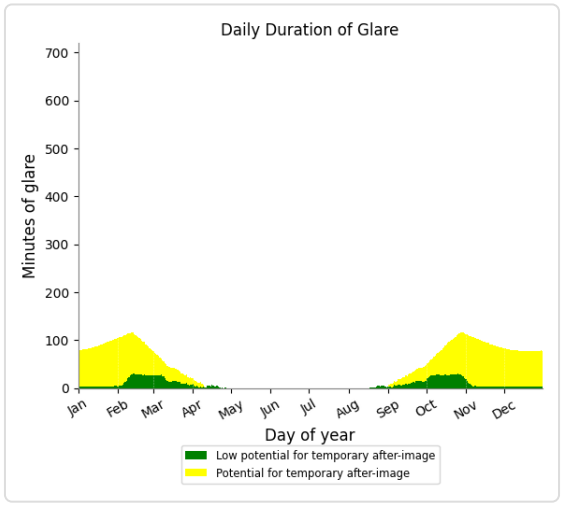
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 15	1,313	21.9	0	0.0
OP 1	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0

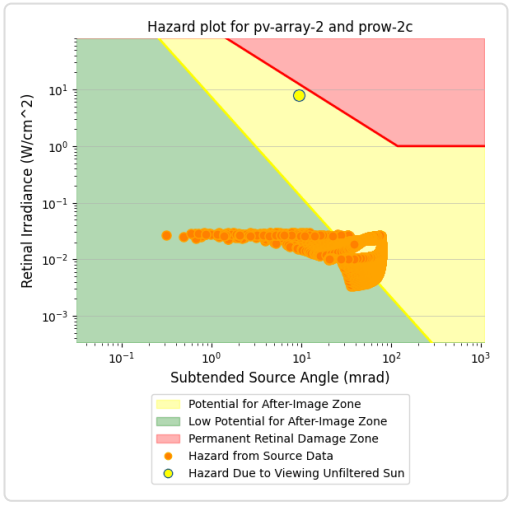
PV array 2 and Route: PRoW 2C

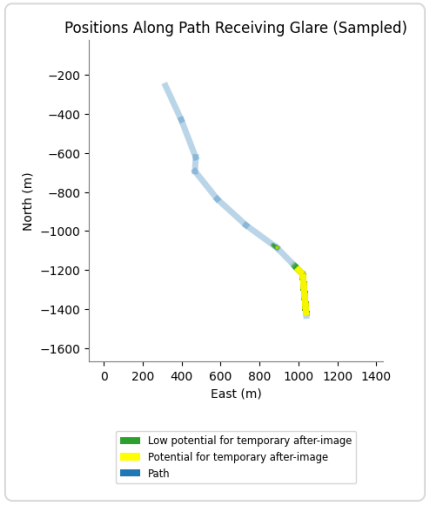
Yellow glare: 13,395 min.

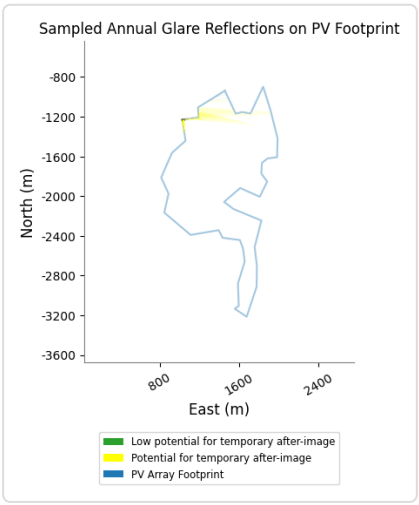
Green glare: 2,740 min.







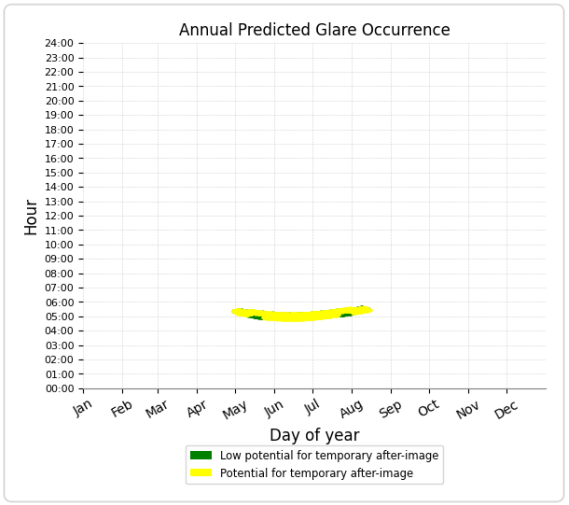


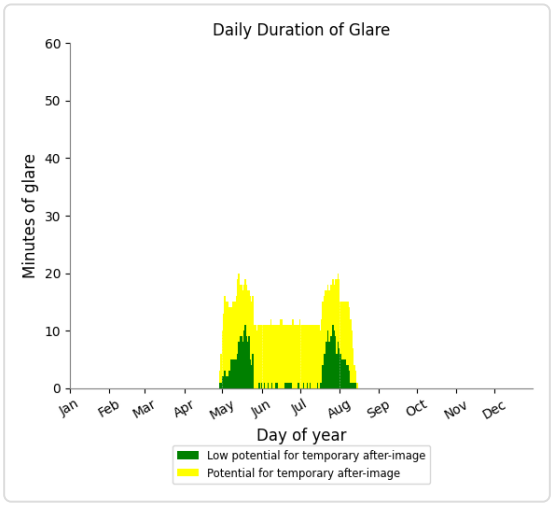


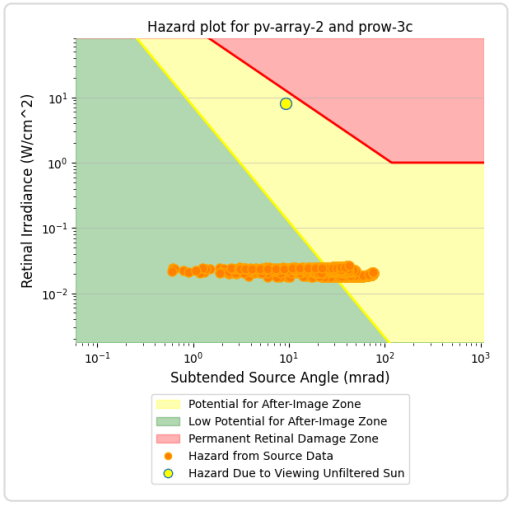
PV array 2 and Route: PRoW 3C

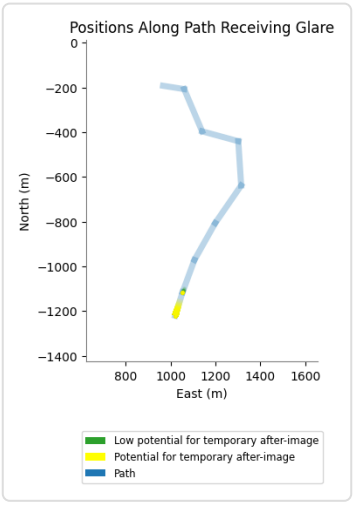
Yellow glare: 1,095 min.

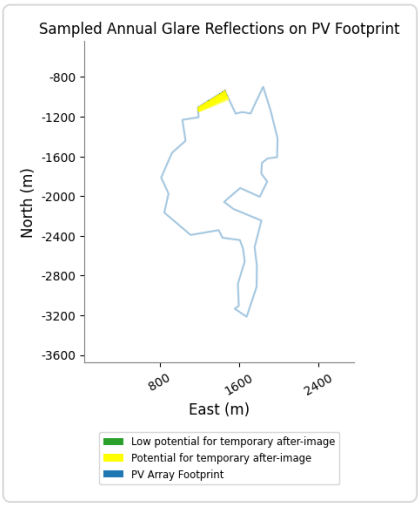
Green glare: 319 min.







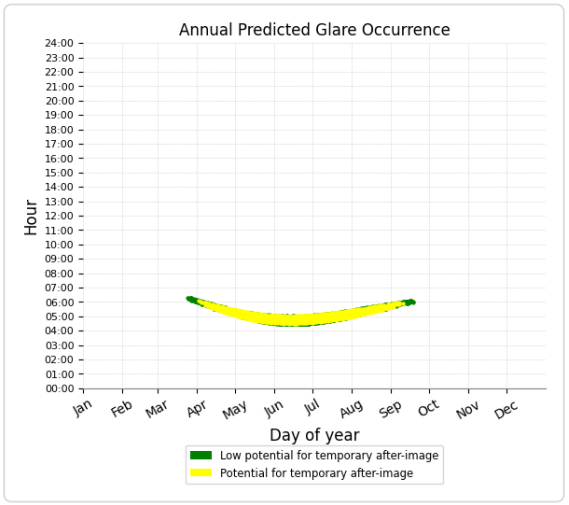


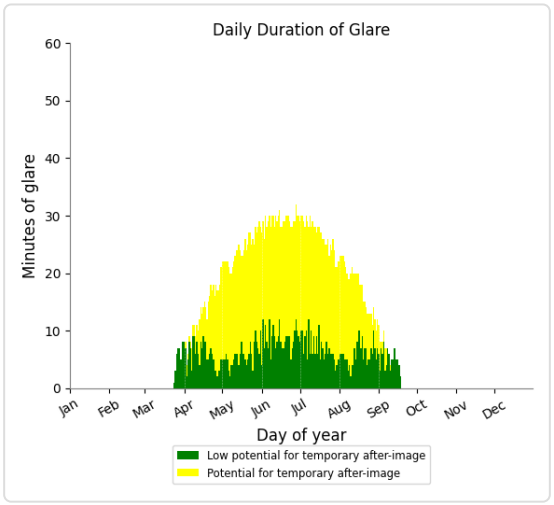


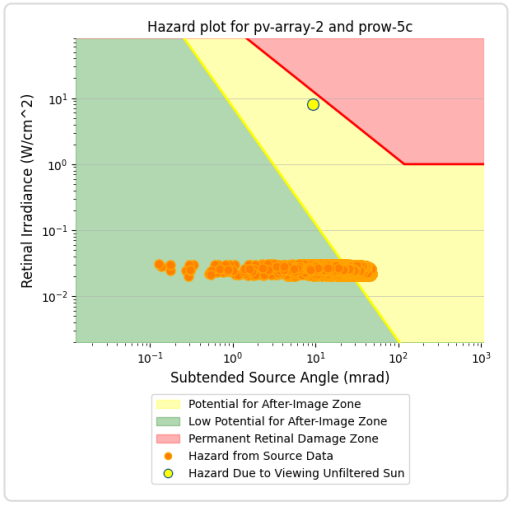
PV array 2 and Route: PRoW 5C

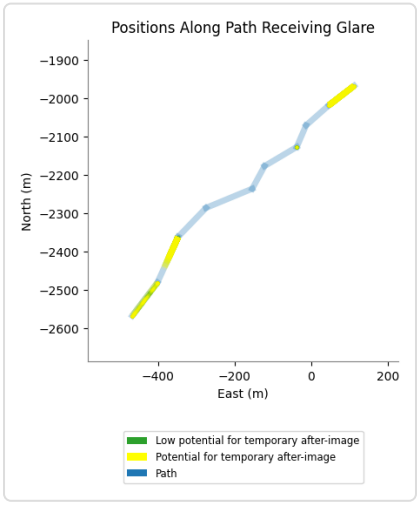
Yellow glare: 2,385 min.

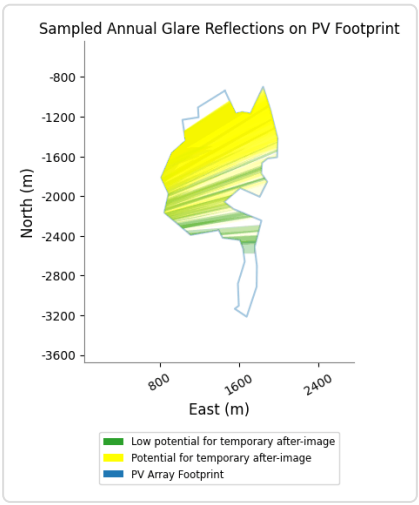
Green glare: 1,152 min.







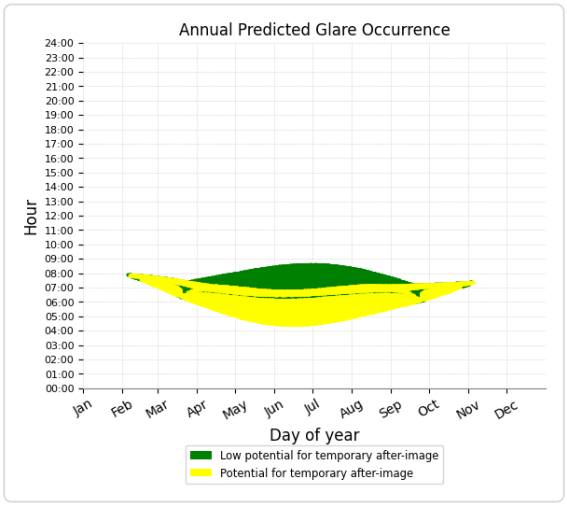


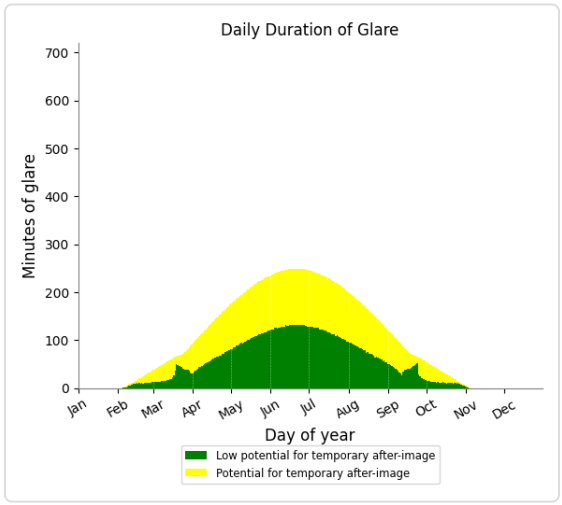


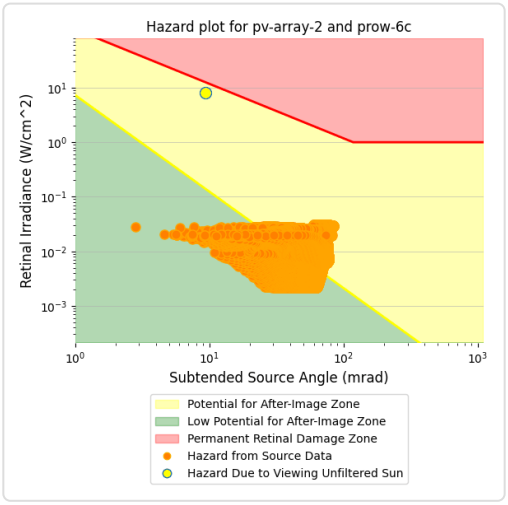
PV array 2 and Route: PRoW 6C

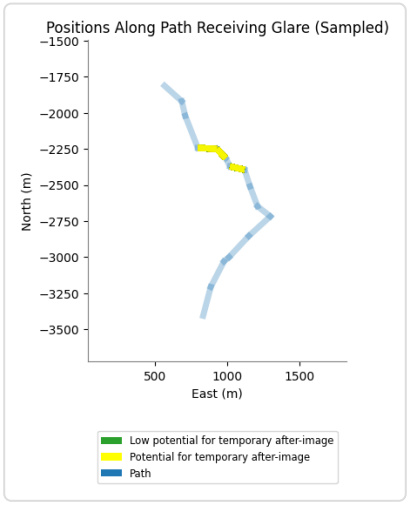
Yellow glare: 18,628 min.

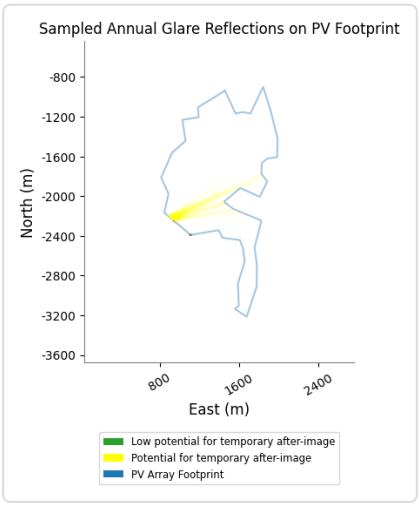
Green glare: 17,237 min.







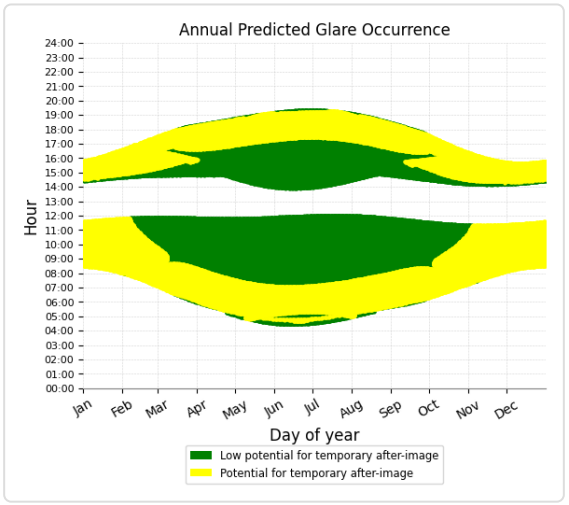


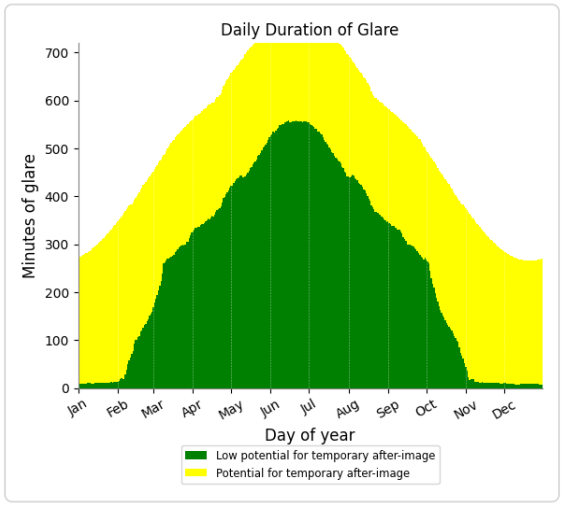


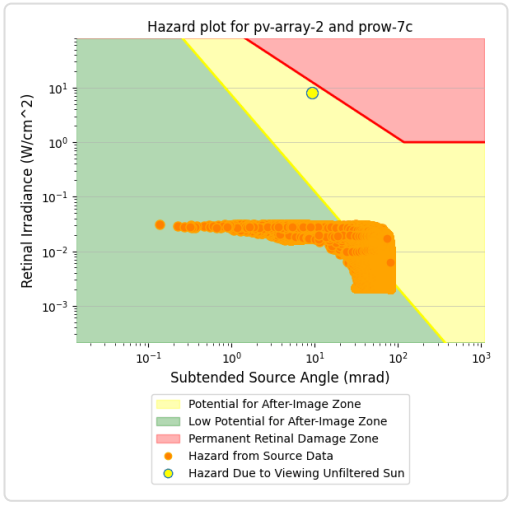
PV array 2 and Route: PRoW 7C

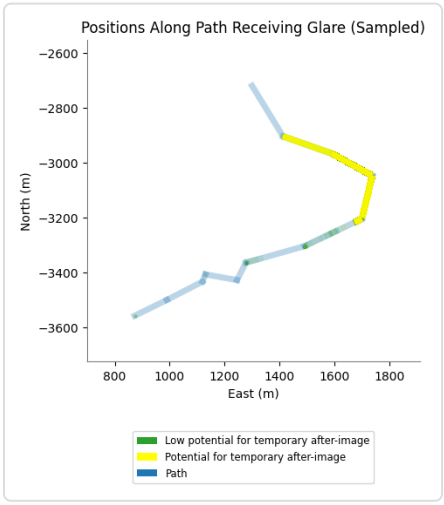
Yellow glare: 94,653 min.

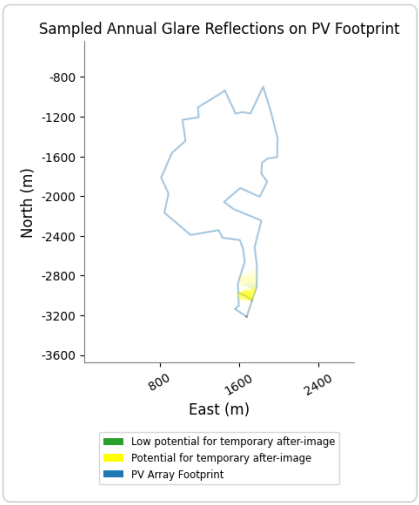
Green glare: 95,465 min.







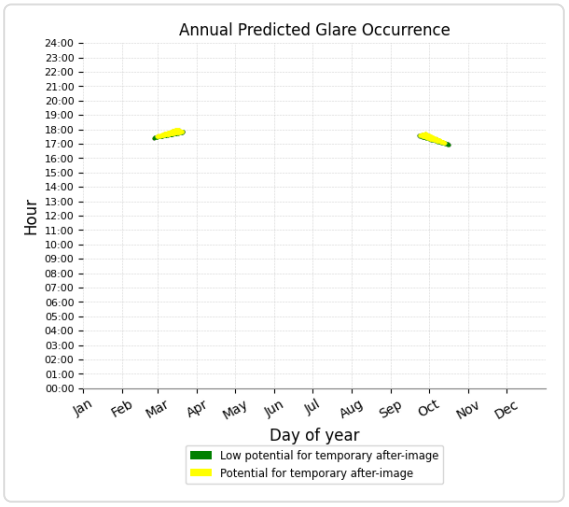


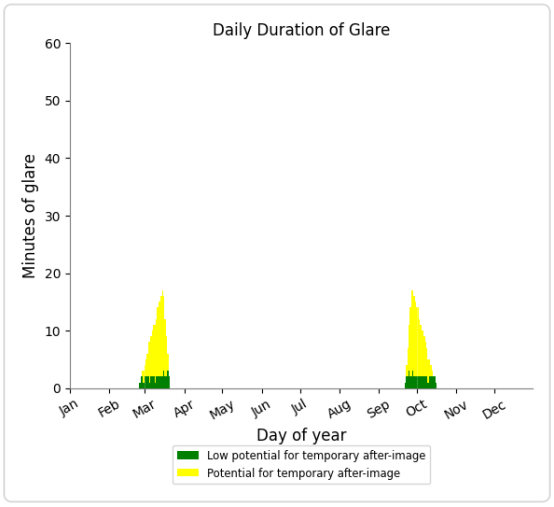


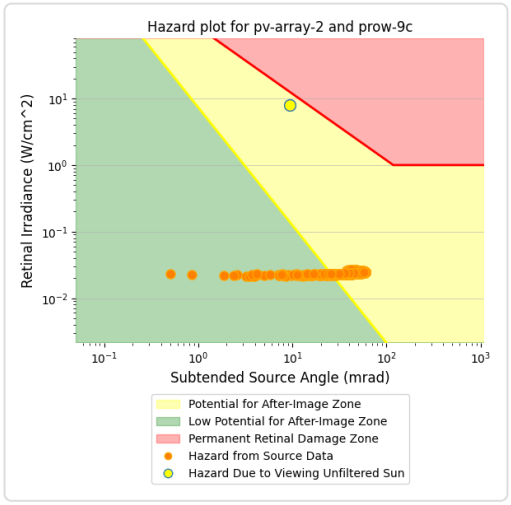
PV array 2 and Route: PRoW 9C

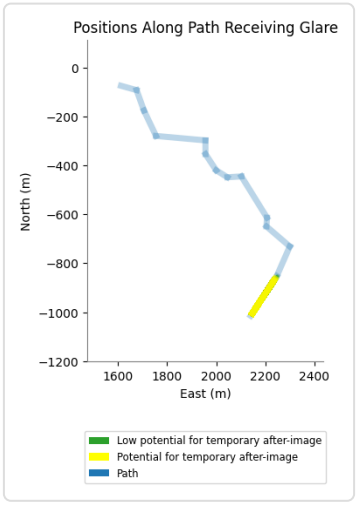
Yellow glare: 339 min.

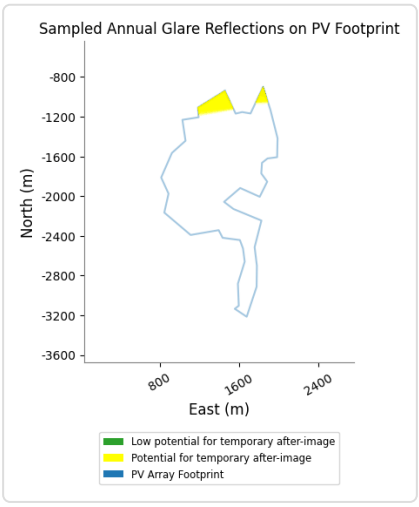
Green glare: 95 min.







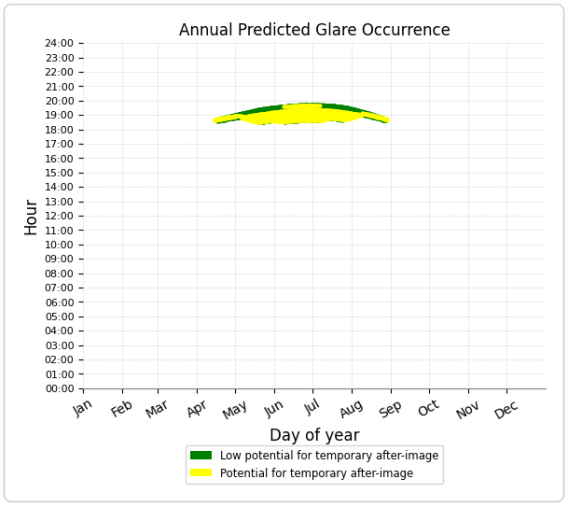


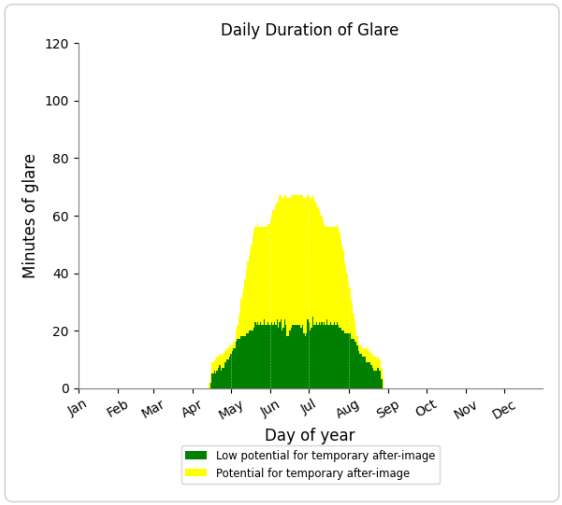


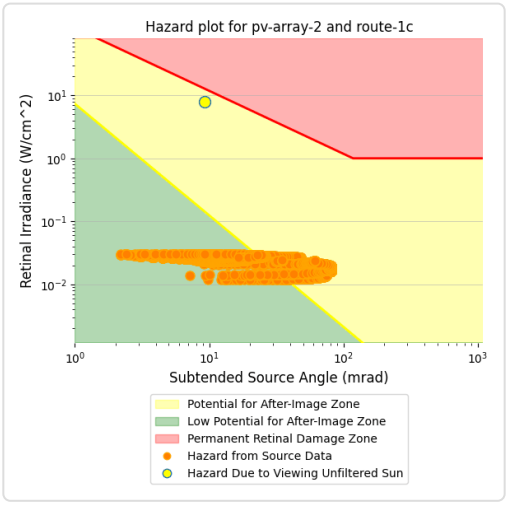
PV array 2 and Route: Route 1C

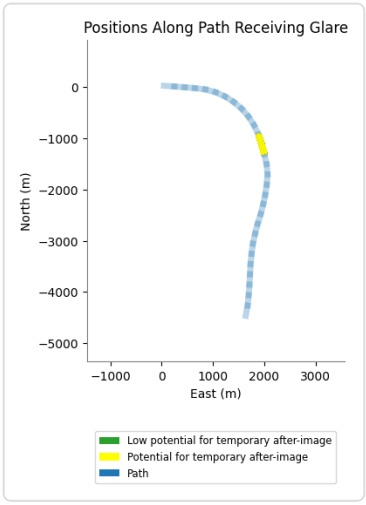
Yellow glare: 3,351 min.

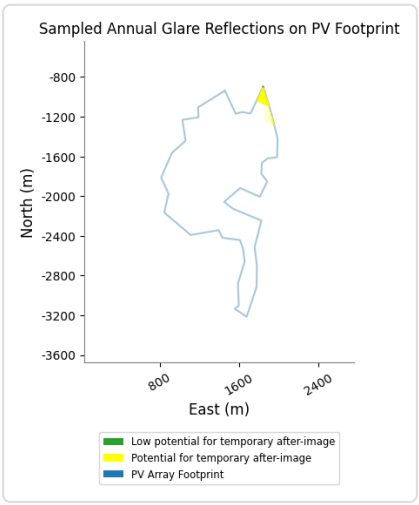
Green glare: 2,333 min.







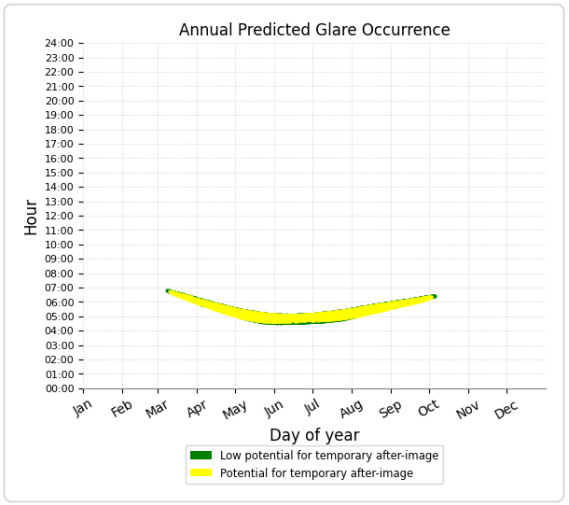


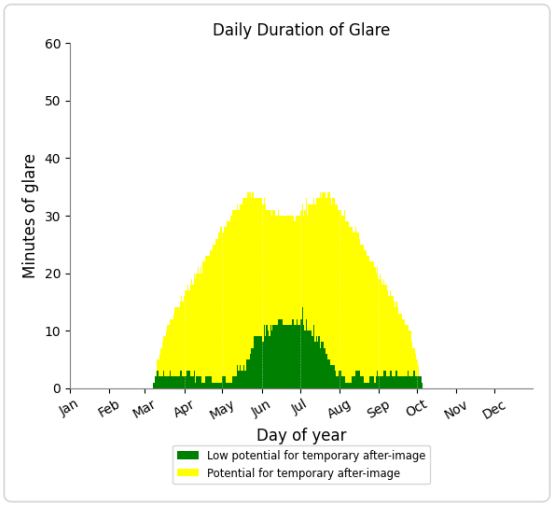


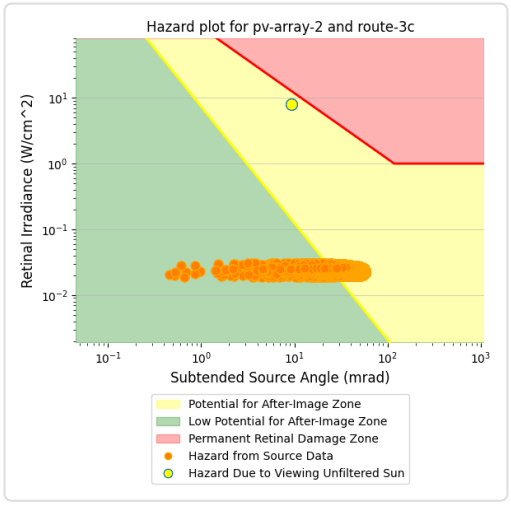
PV array 2 and Route: Route 3C

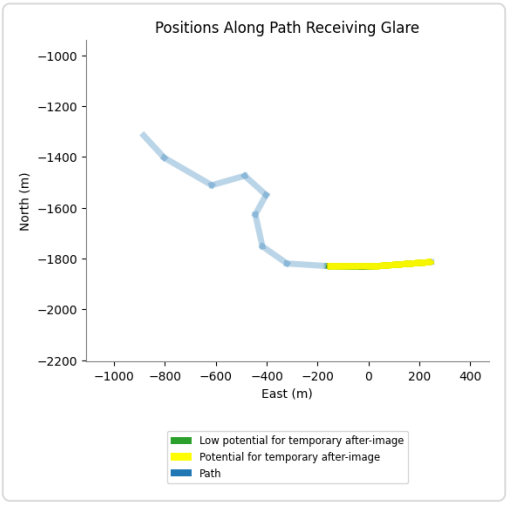
Yellow glare: 4,082 min.

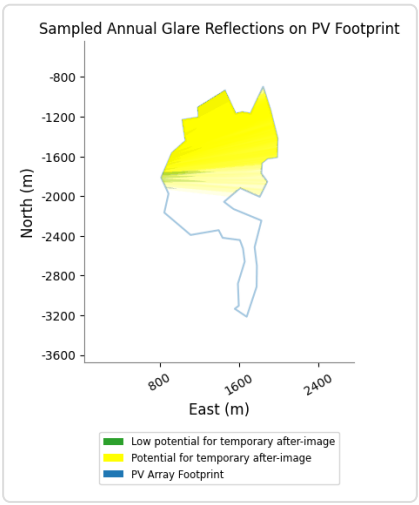
Green glare: 937 min.







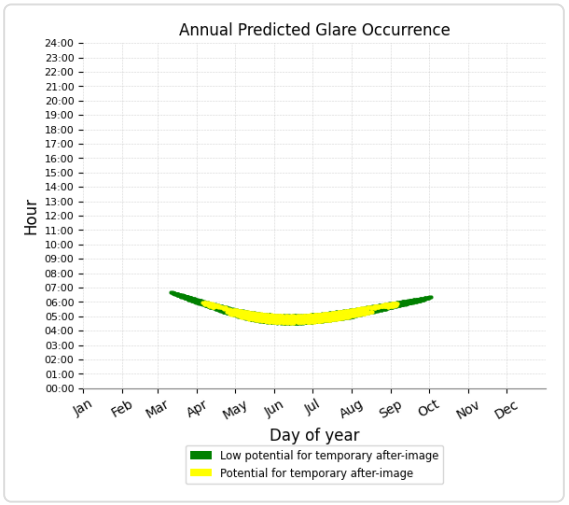


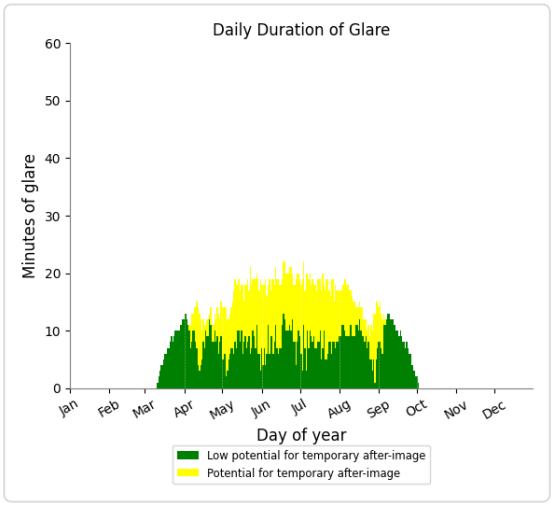


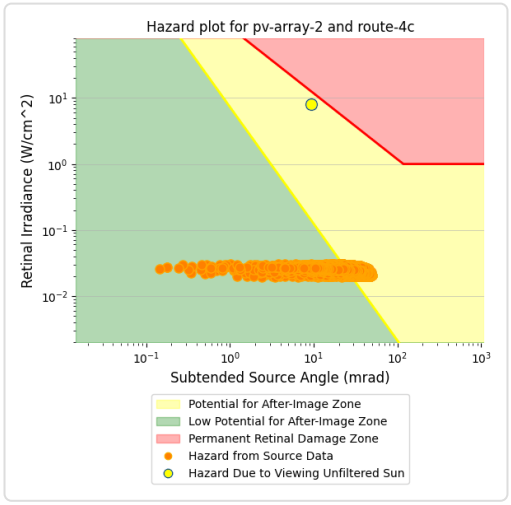
PV array 2 and Route: Route 4C

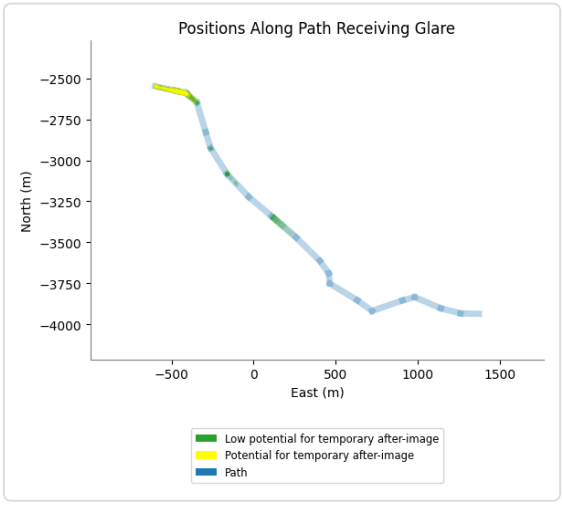
Yellow glare: 1,305 min.

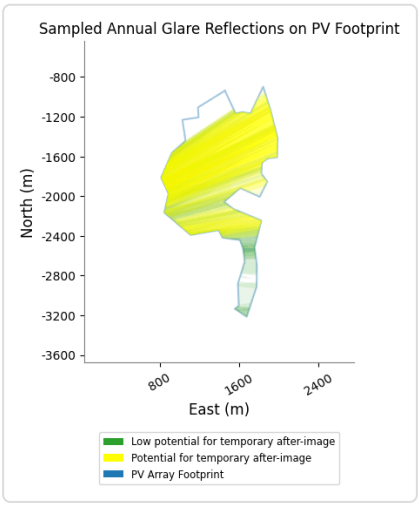
Green glare: 1,629 min.







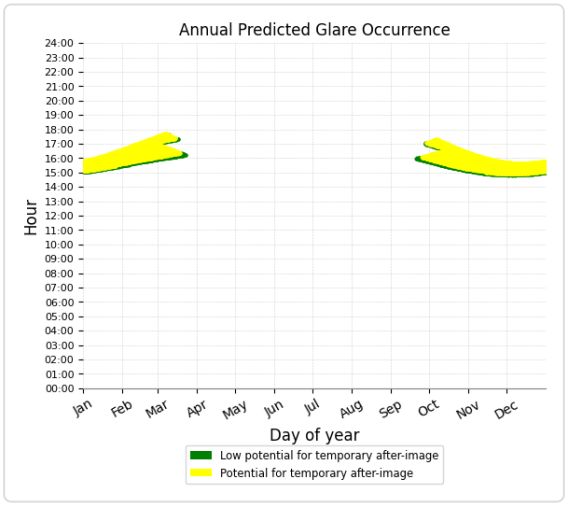


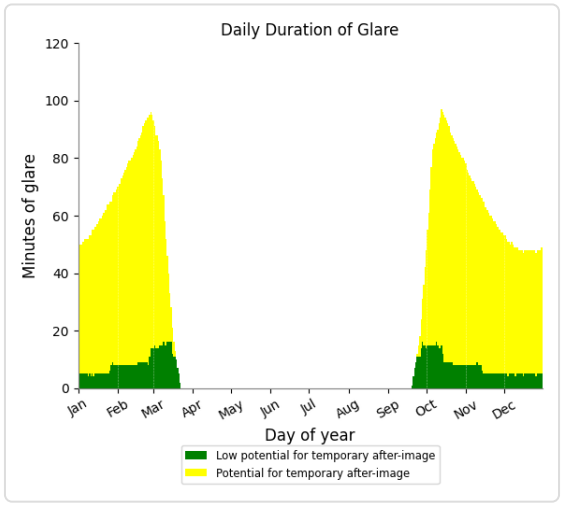


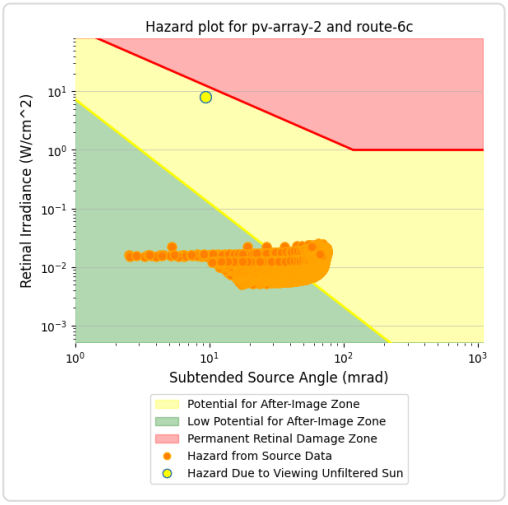
PV array 2 and Route: Route 6C

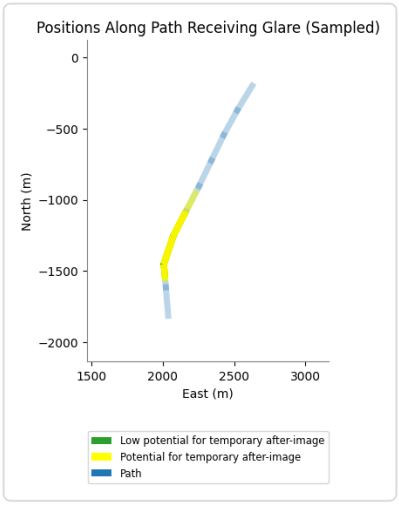
Yellow glare: 9,949 min.

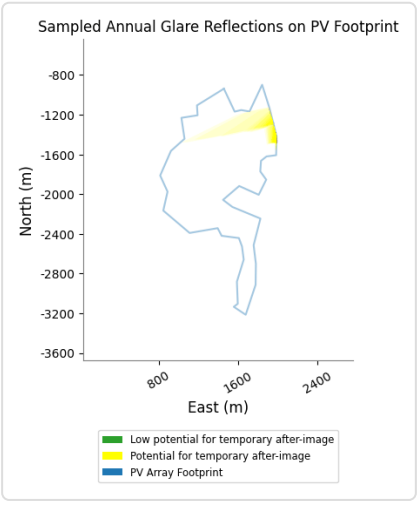
Green glare: 1,504 min.











PV array 2 and Route: PRoW 1C

No glare found

PV array 2 and Route: PRoW 4C

No glare found

PV array 2 and Route: Route 1C - Part 2

No glare found

PV array 2 and Route: Route 2C

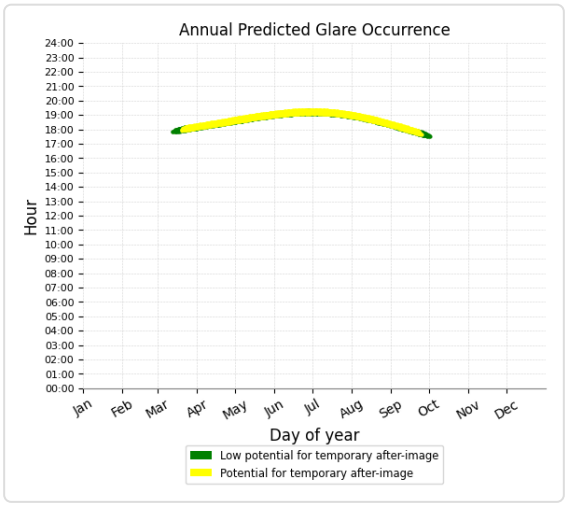
No glare found

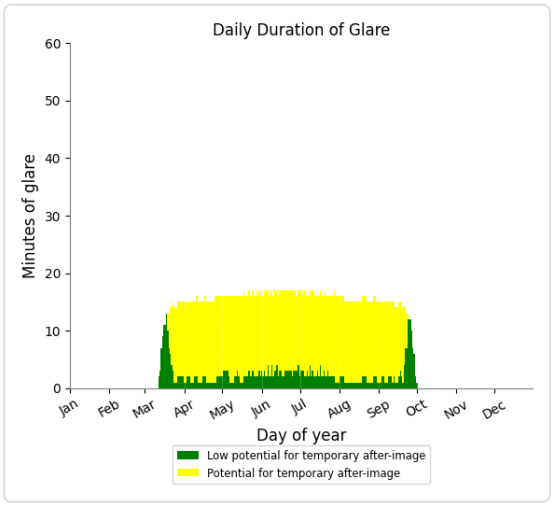
PV array 2 and Route: Route 5C

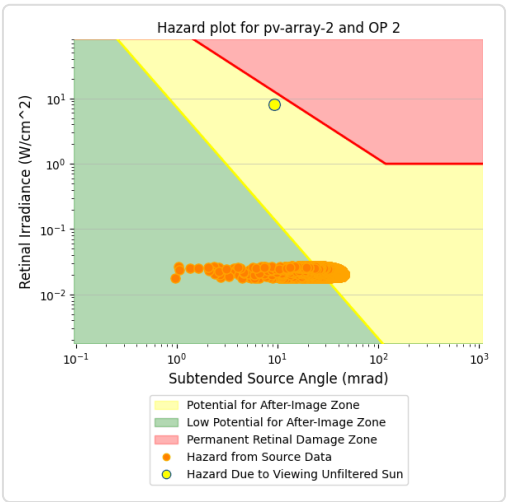
No glare found

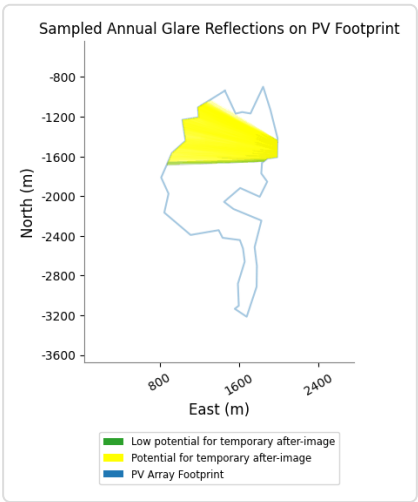
PV array 2 and OP 2

Yellow glare: 2,577 min.
Green glare: 511 min.





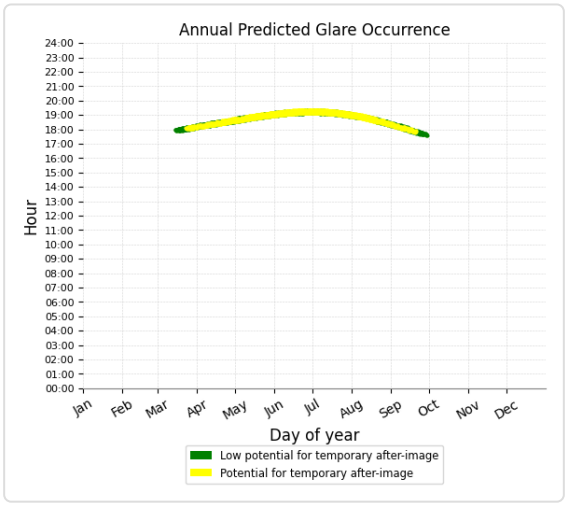


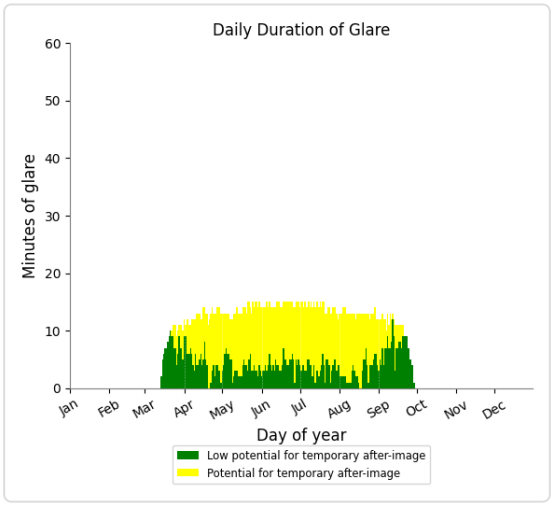


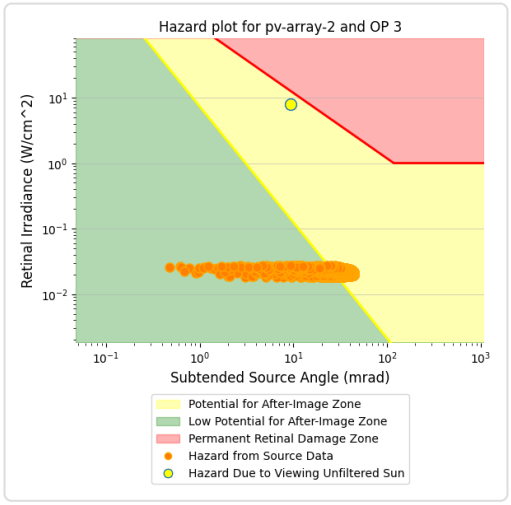
PV array 2 and OP 3

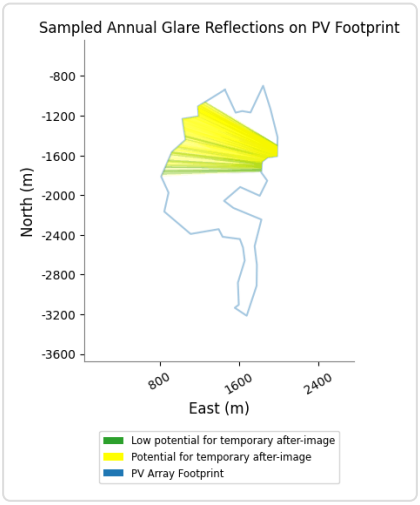
Yellow glare: 1,634 min.

Green glare: 890 min.





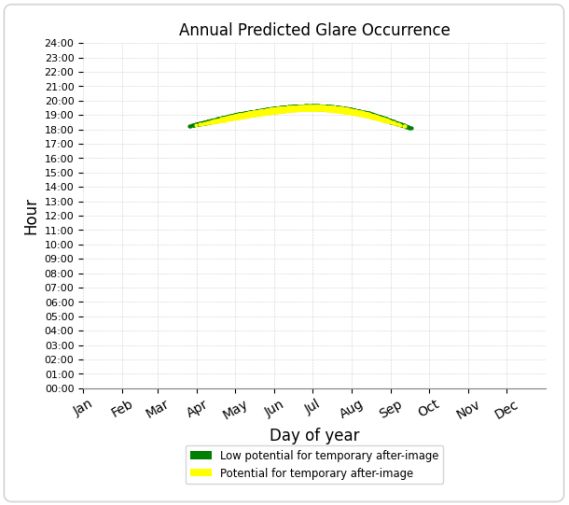


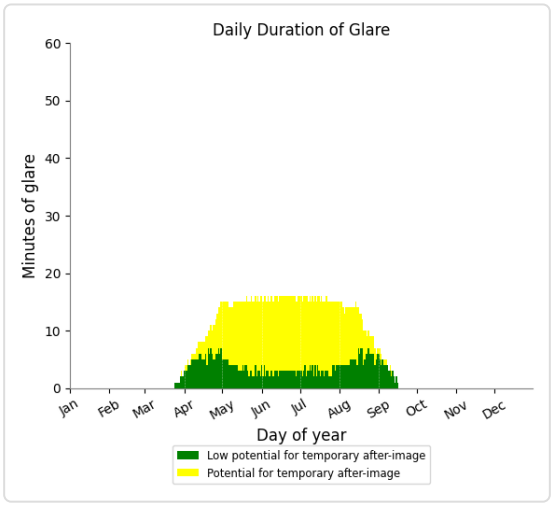


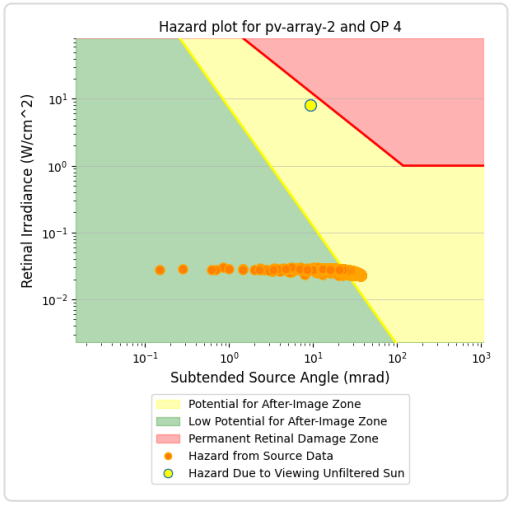
PV array 2 and OP 4

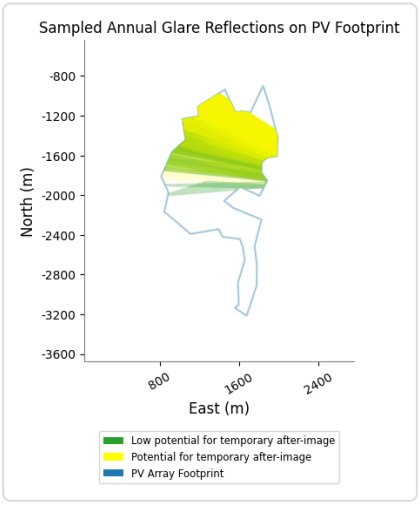
Yellow glare: 1,447 min.

Green glare: 667 min.





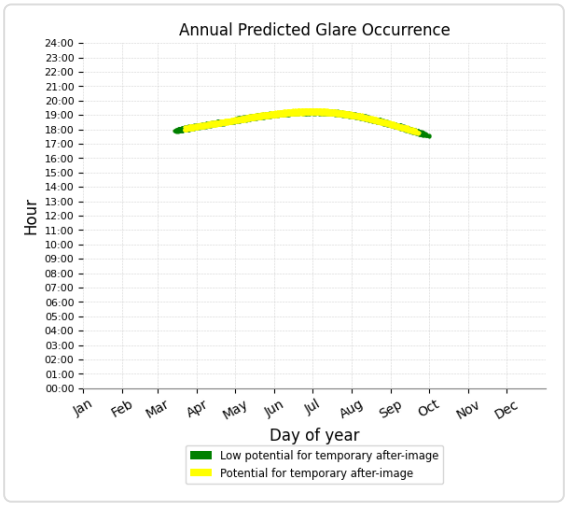


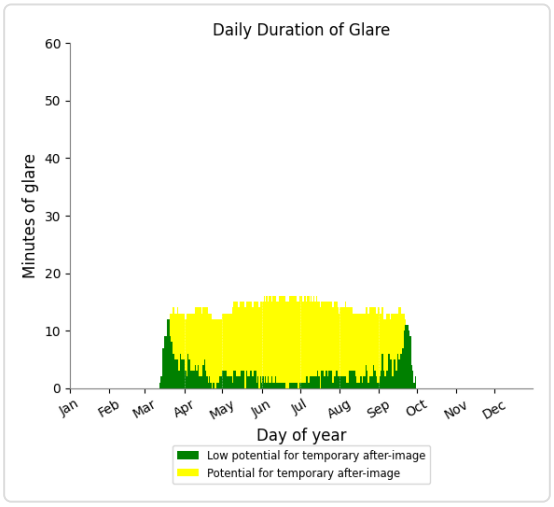


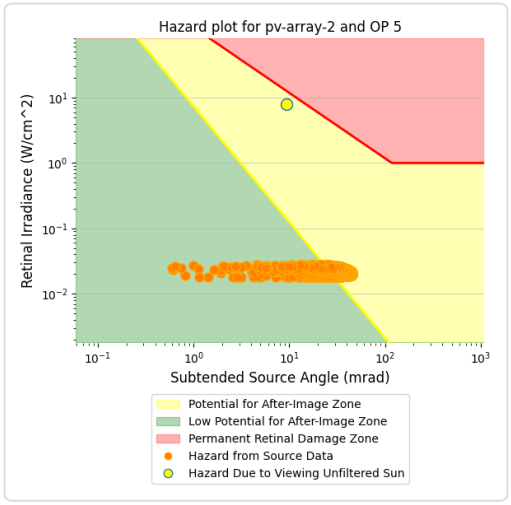
PV array 2 and OP 5

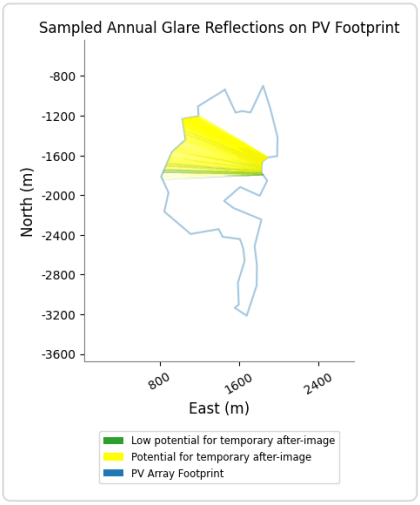
Yellow glare: 2,155 min.

Green glare: 580 min.





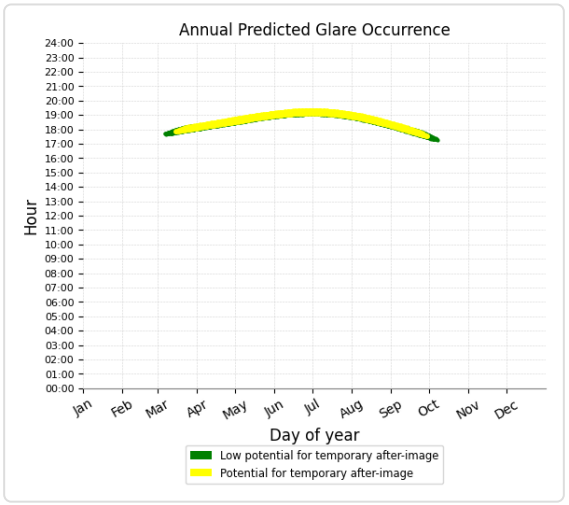


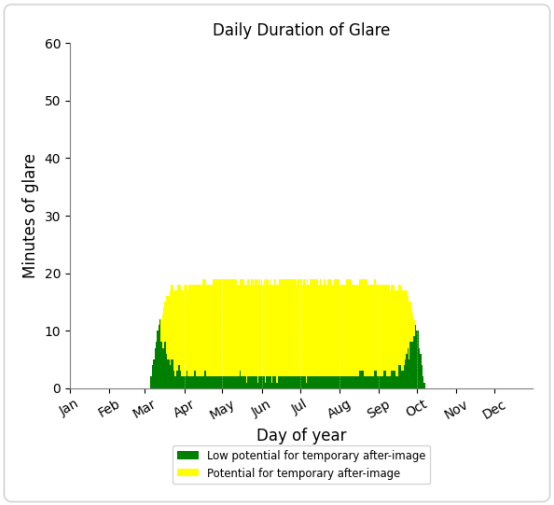


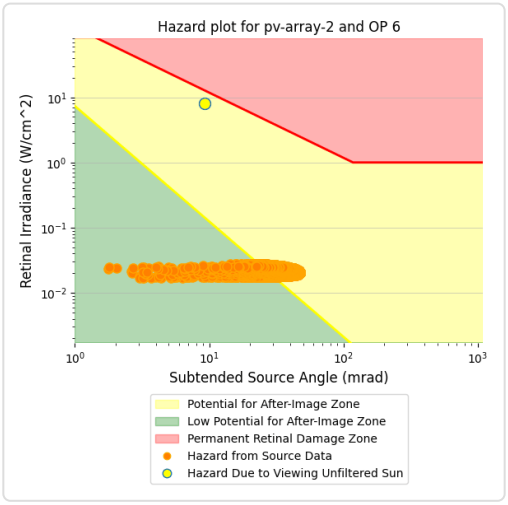
PV array 2 and OP 6

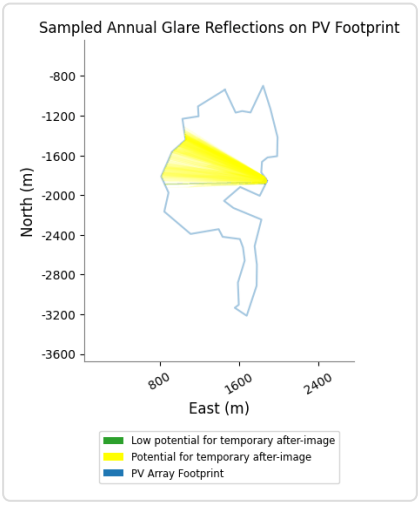
Yellow glare: 3,122 min.

Green glare: 616 min.





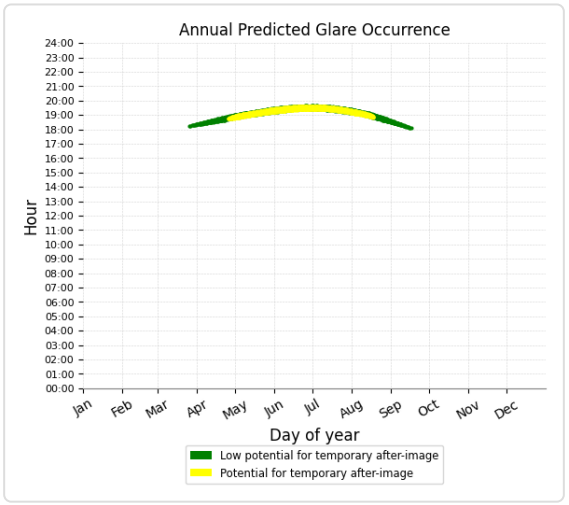


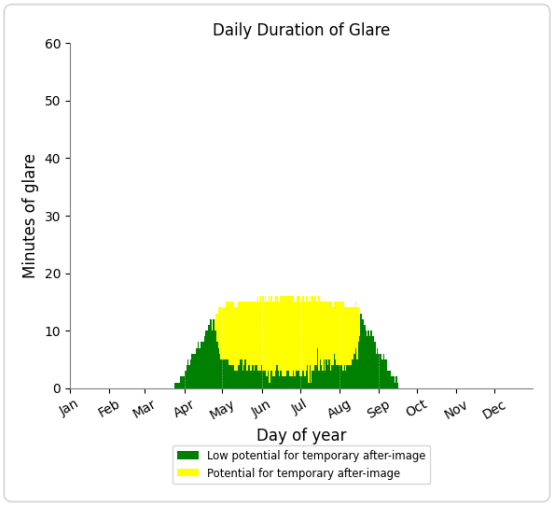


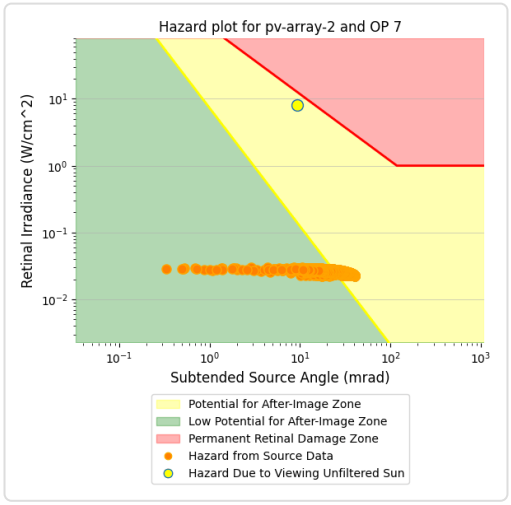
PV array 2 and OP 7

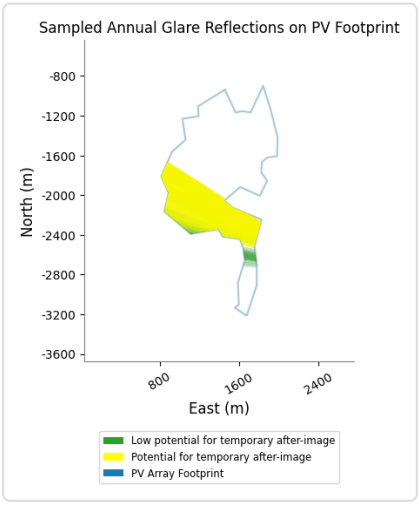
Yellow glare: 1,286 min.

Green glare: 821 min.





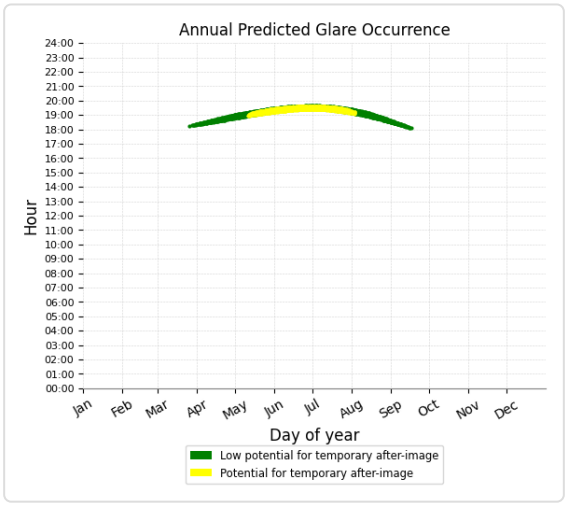


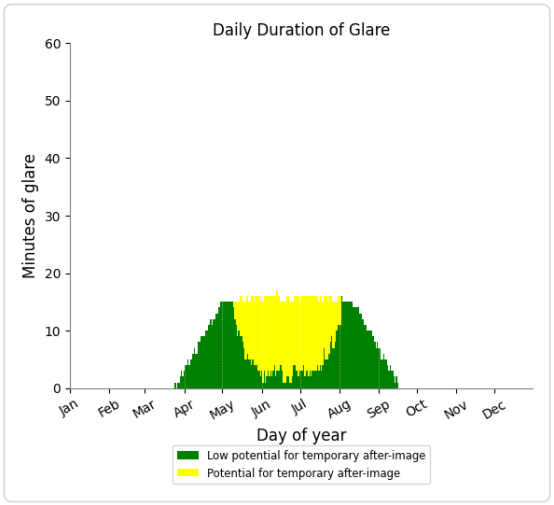


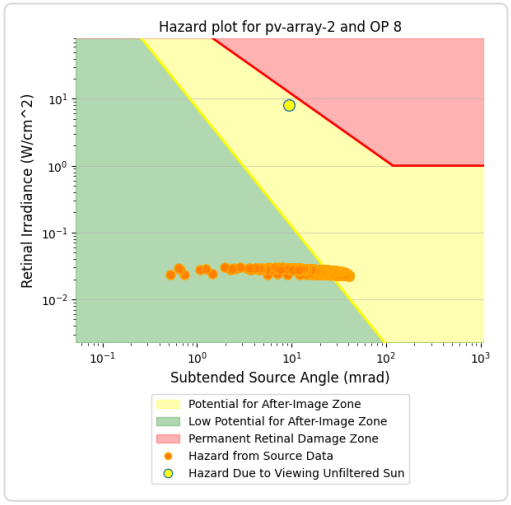
PV array 2 and OP 8

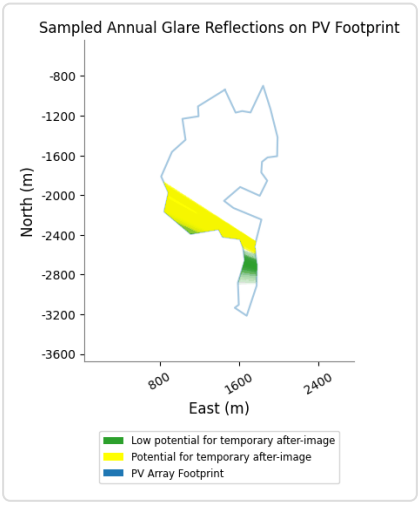
Yellow glare: 947 min.

Green glare: 1,216 min.





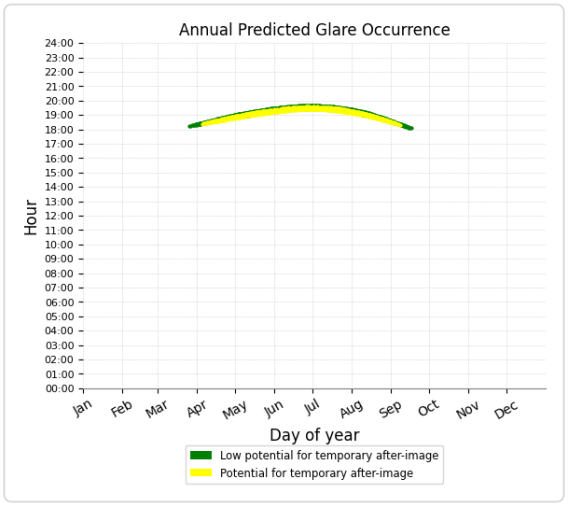


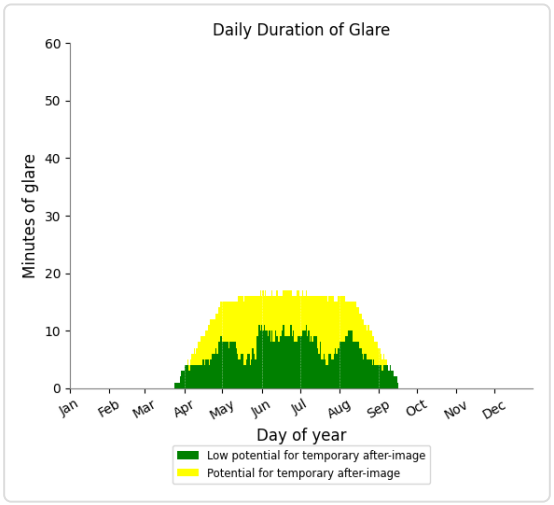


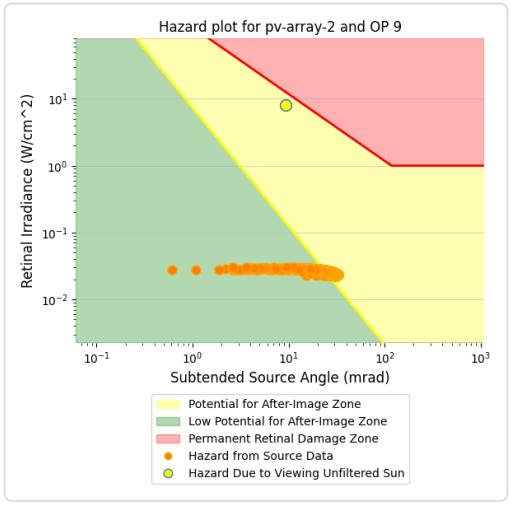
PV array 2 and OP 9

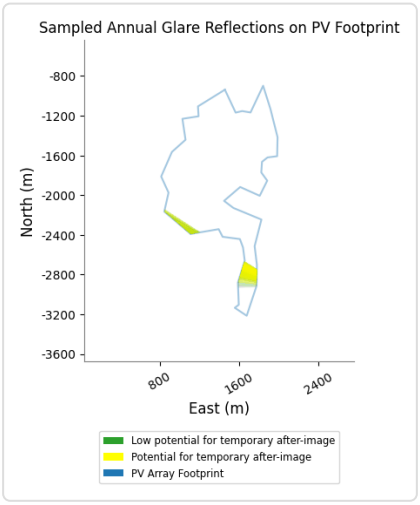
Yellow glare: 1,069 min.

Green glare: 1,144 min.





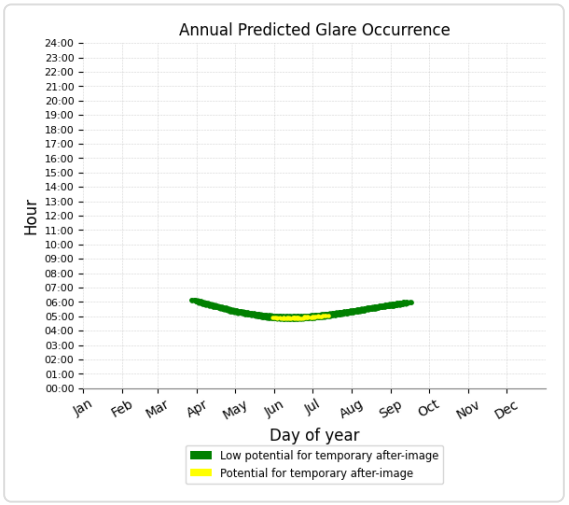


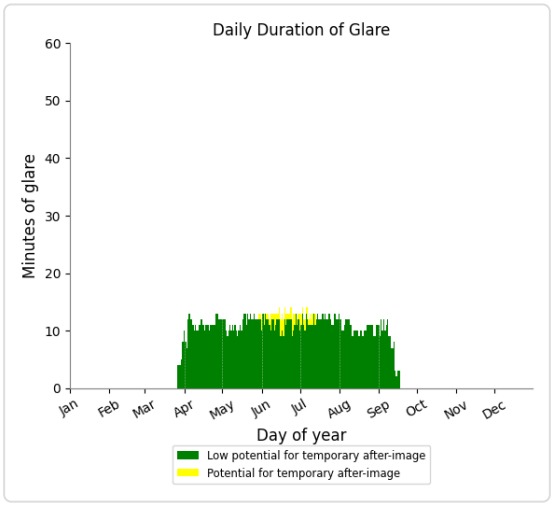


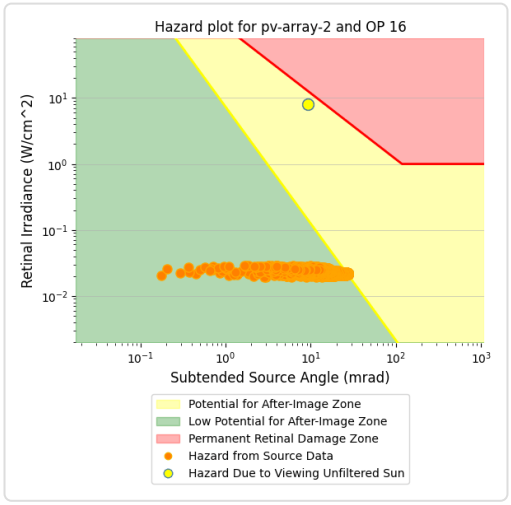
PV array 2 and OP 16

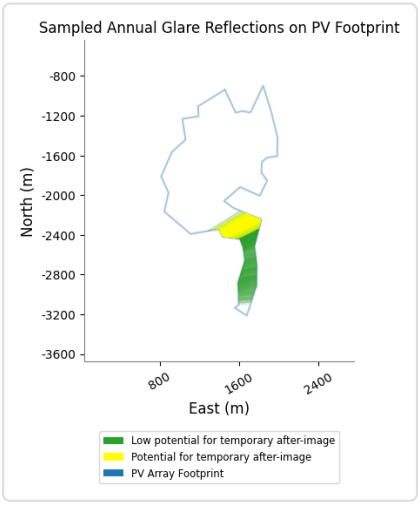
Yellow glare: 71 min.

Green glare: 1,876 min.





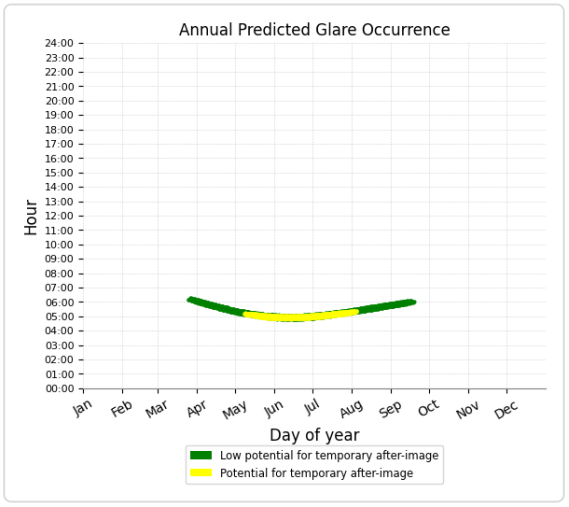


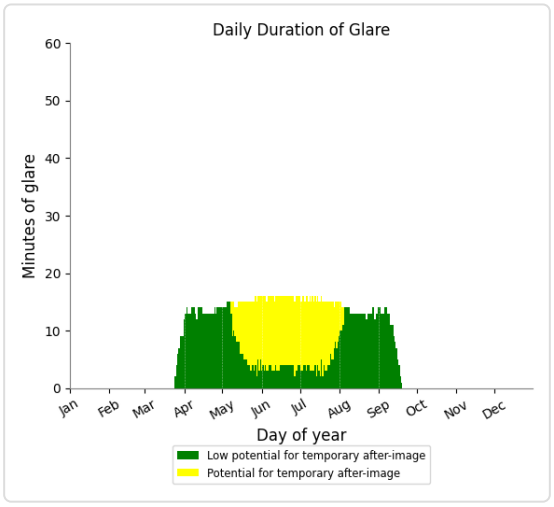


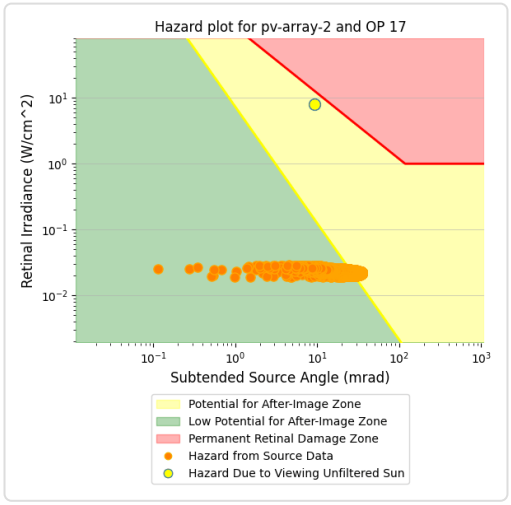
PV array 2 and OP 17

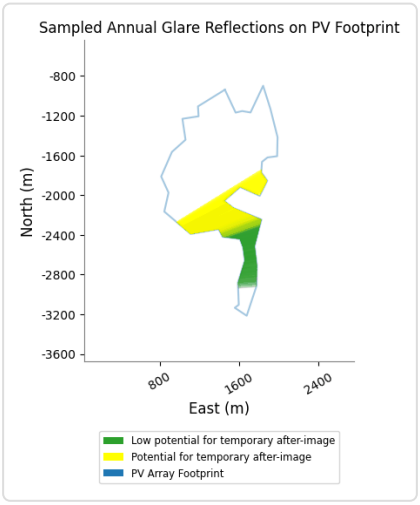
Yellow glare: 959 min.

Green glare: 1,504 min.





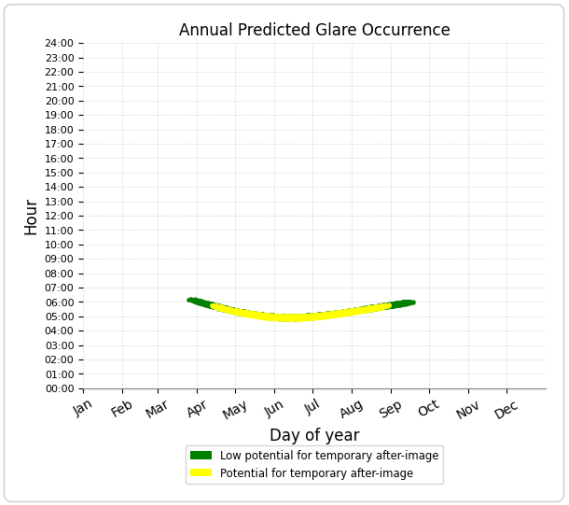


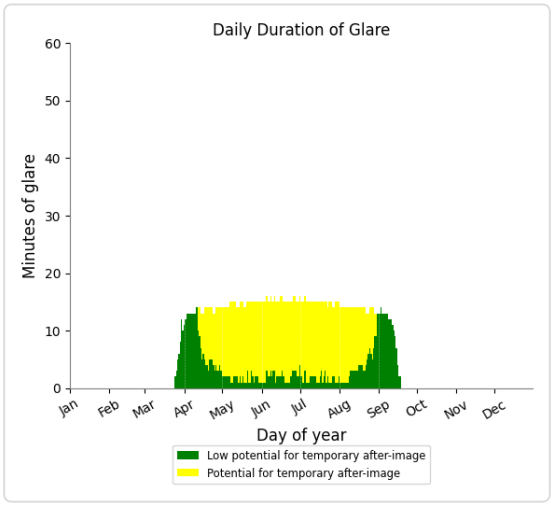


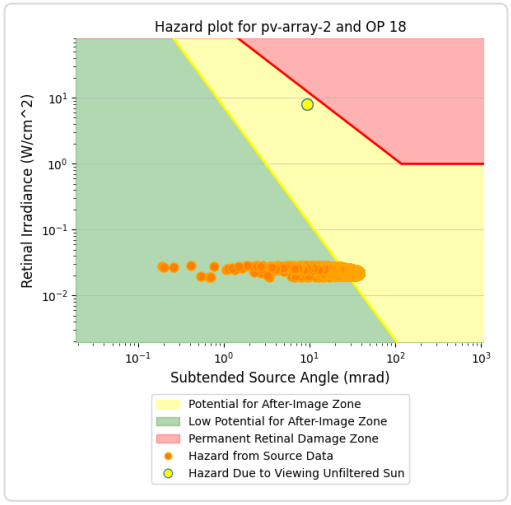
PV array 2 and OP 18

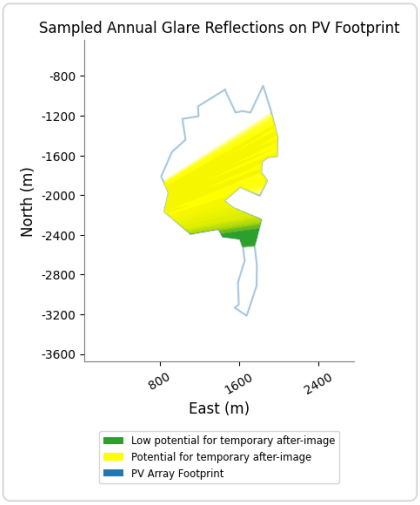
Yellow glare: 1,689 min.

Green glare: 749 min.





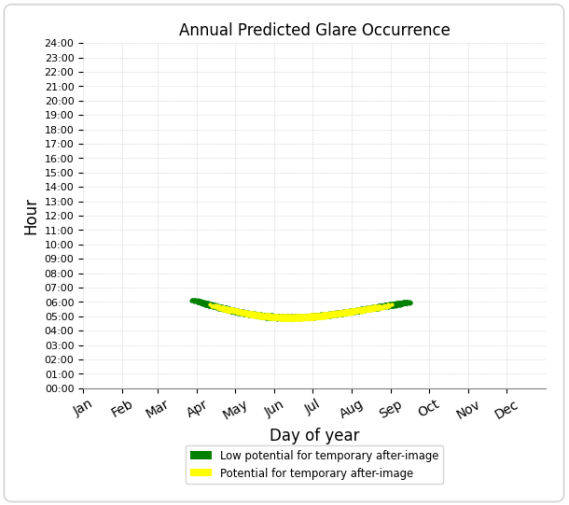


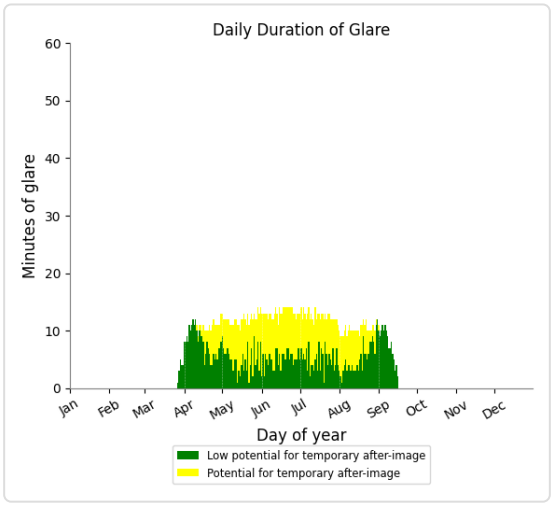


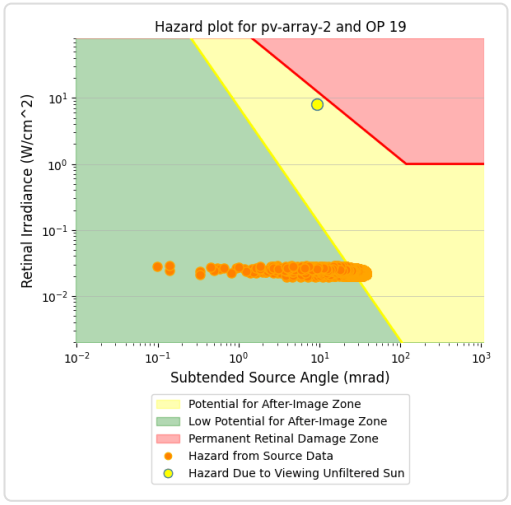
PV array 2 and OP 19

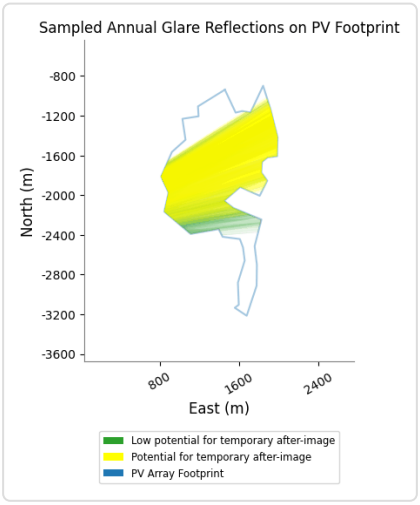
Yellow glare: 932 min.

Green glare: 998 min.





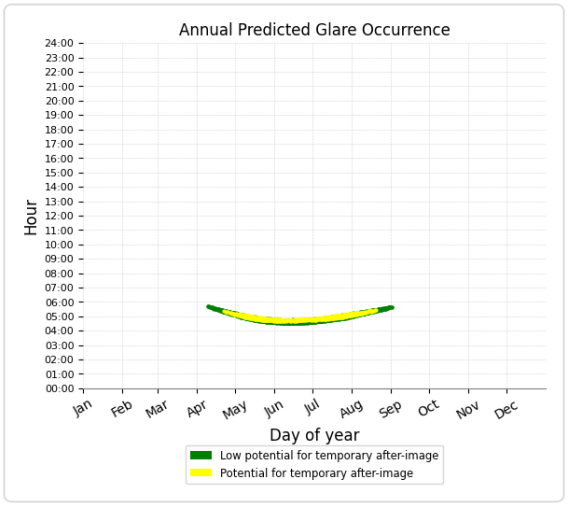


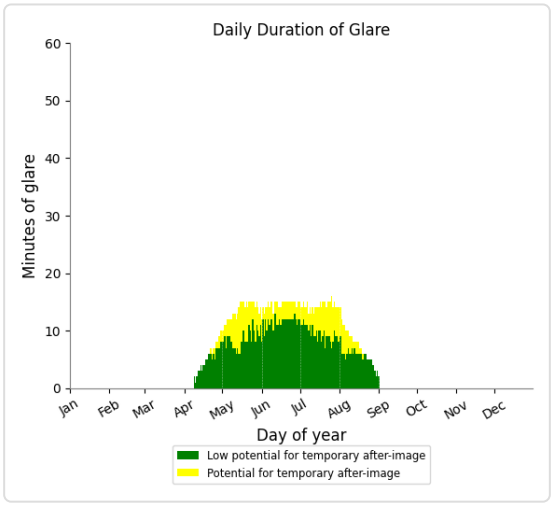


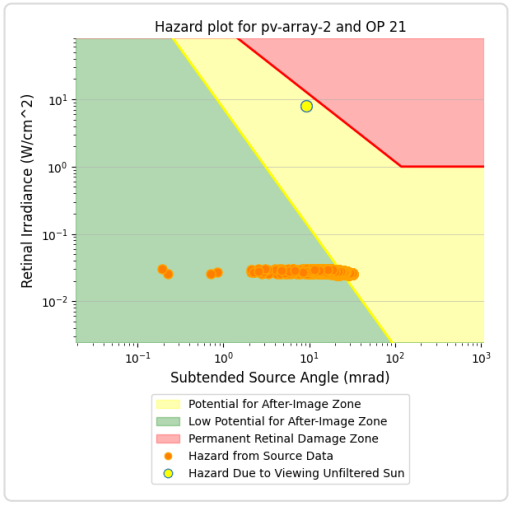
PV array 2 and OP 21

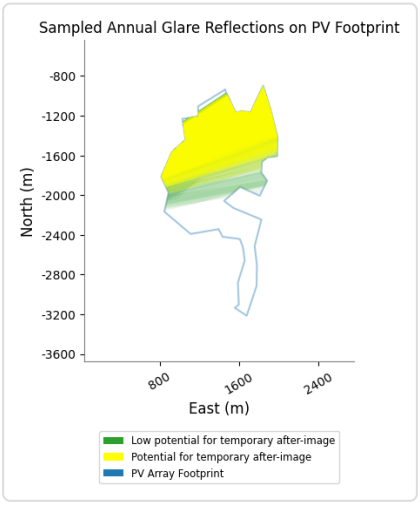
Yellow glare: 459 min.

Green glare: 1,189 min.





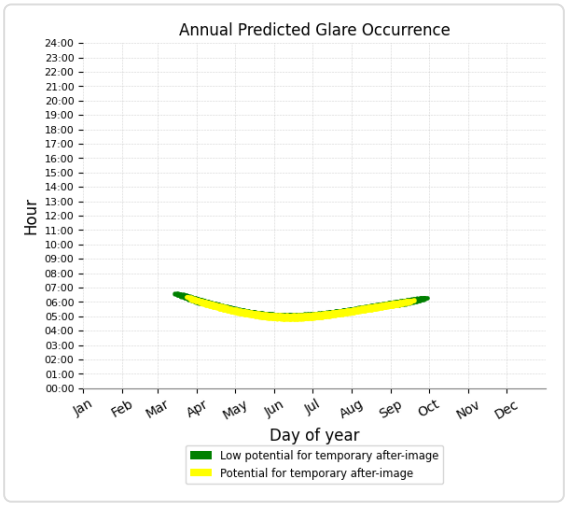


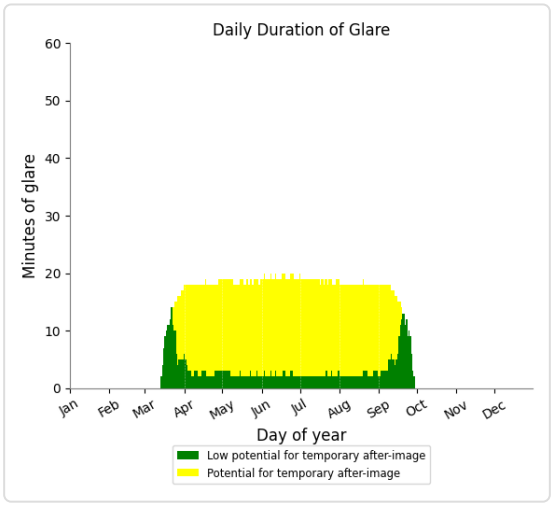


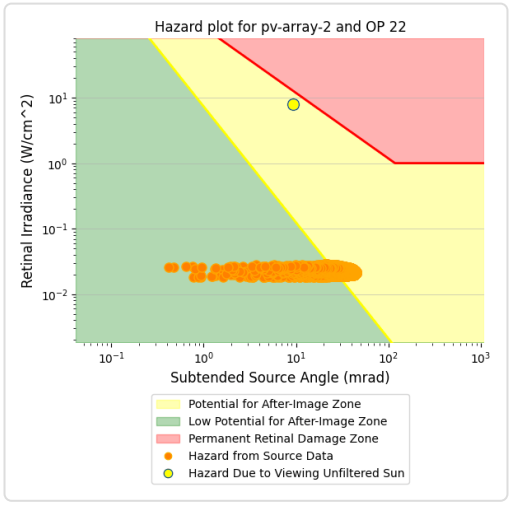
PV array 2 and OP 22

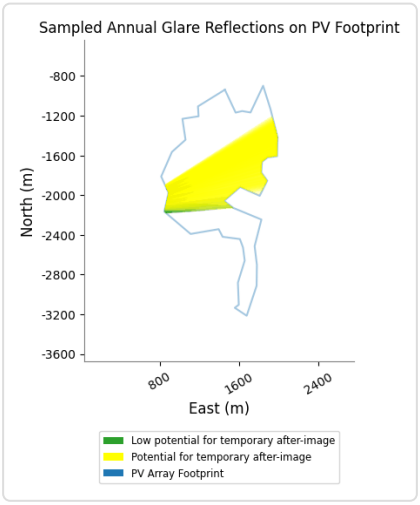
Yellow glare: 2,792 min.

Green glare: 684 min.





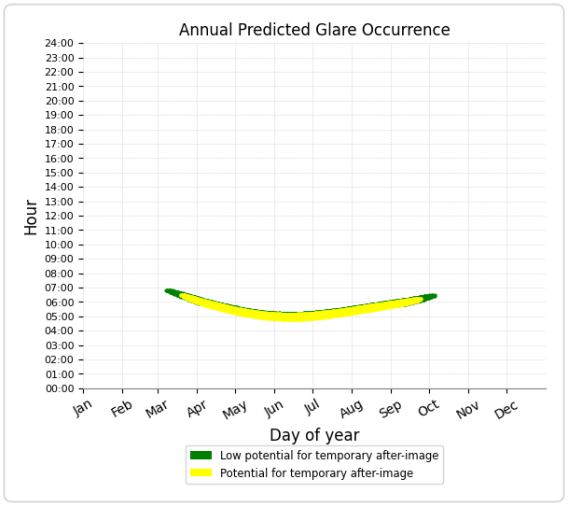


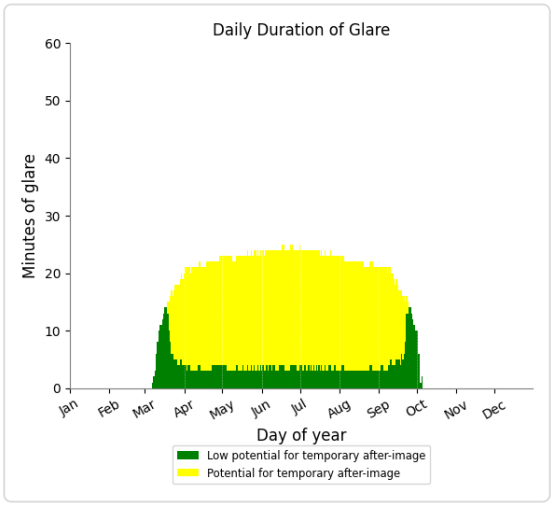


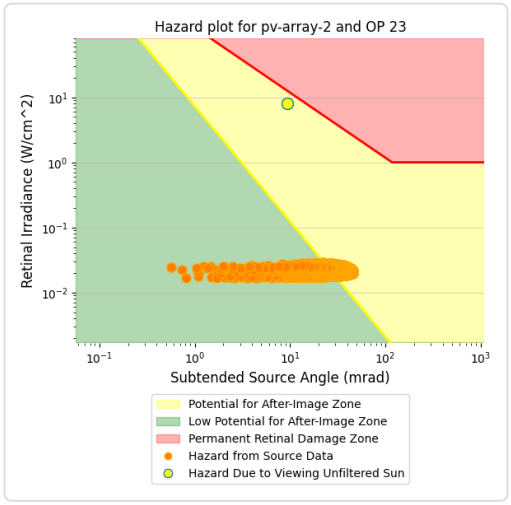
PV array 2 and OP 23

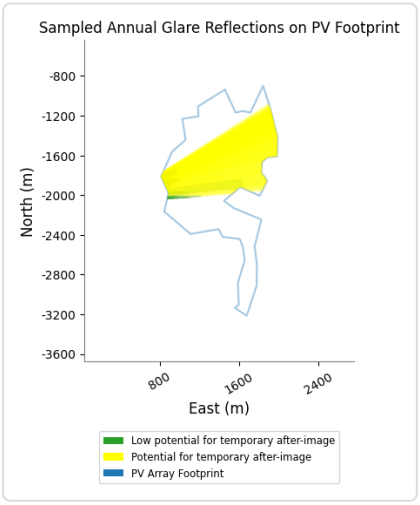
Yellow glare: 3,450 min.

Green glare: 924 min.





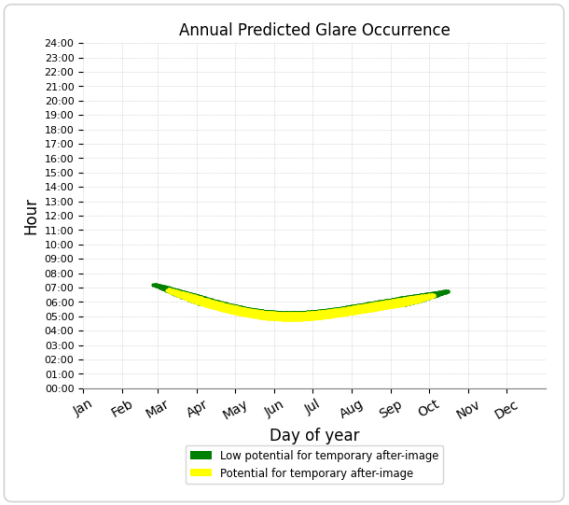


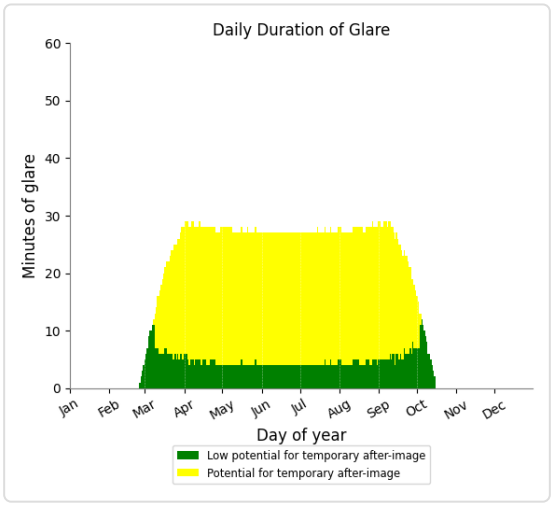


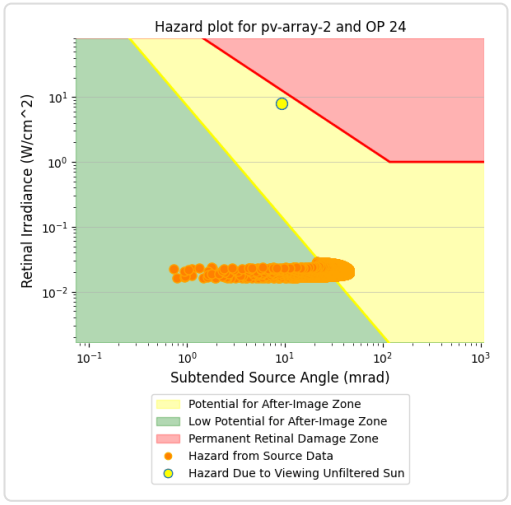
PV array 2 and OP 24

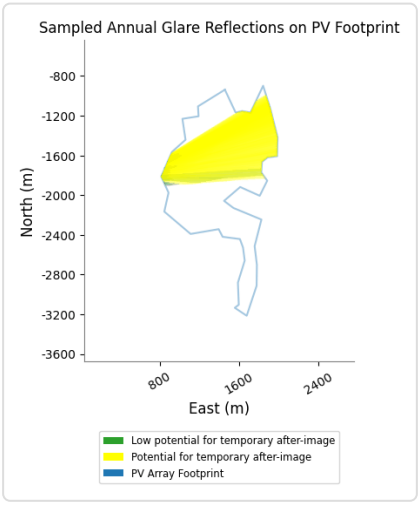
Yellow glare: 4,518 min.

Green glare: 1,148 min.





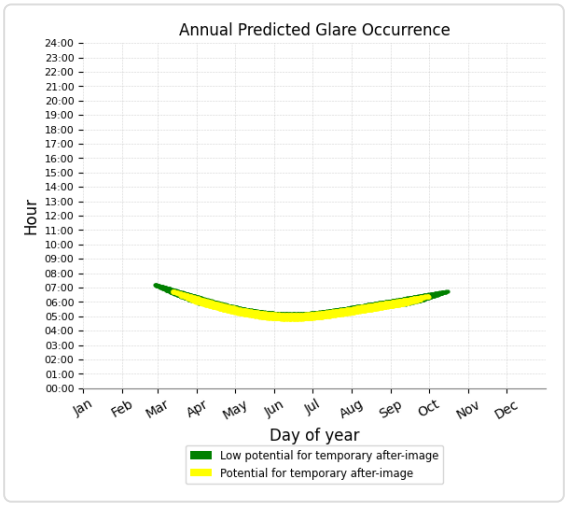


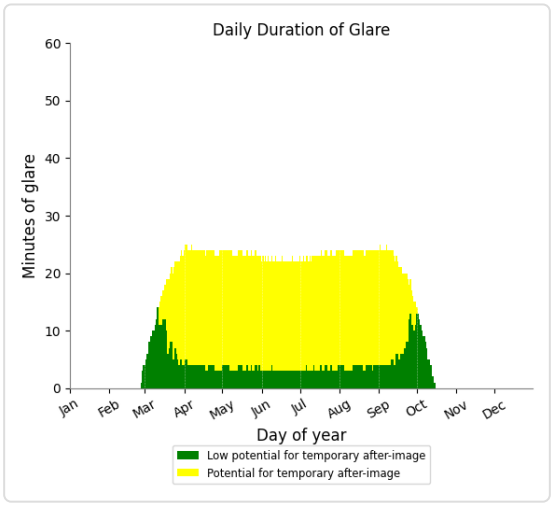


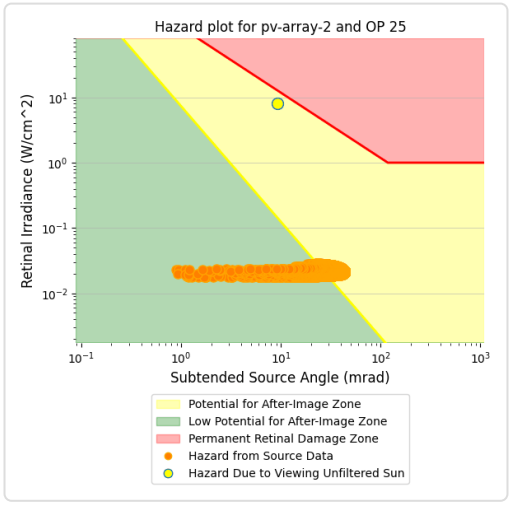
PV array 2 and OP 25

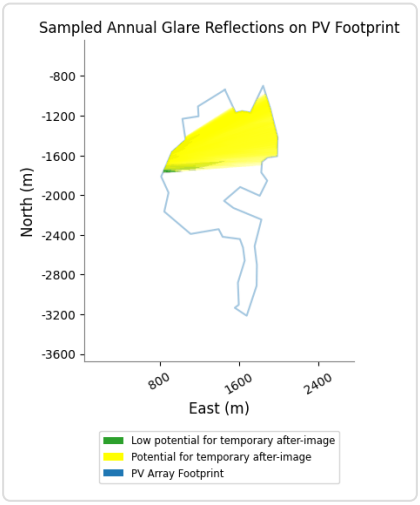
Yellow glare: 3,727 min.

Green glare: 1,090 min.





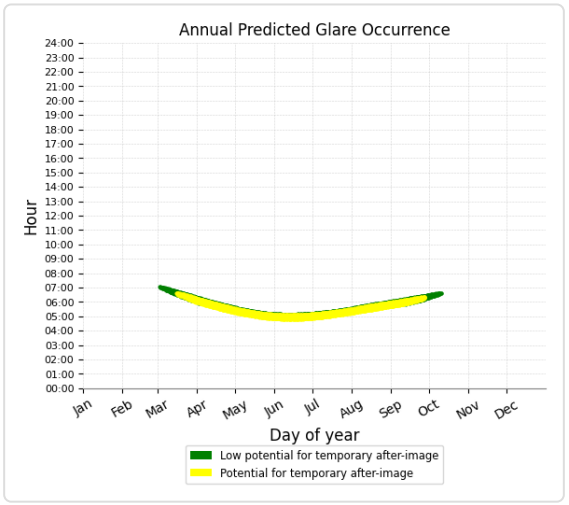


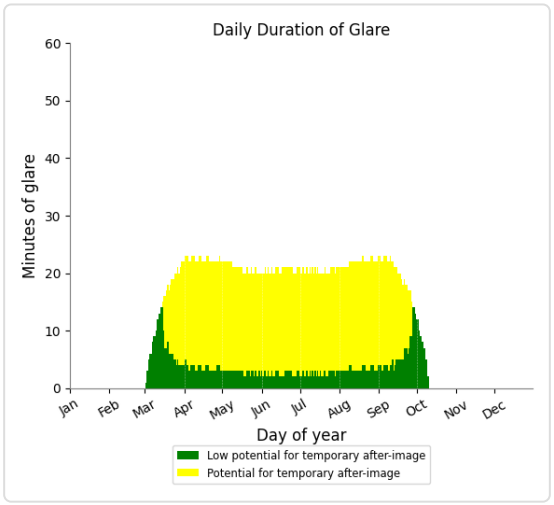


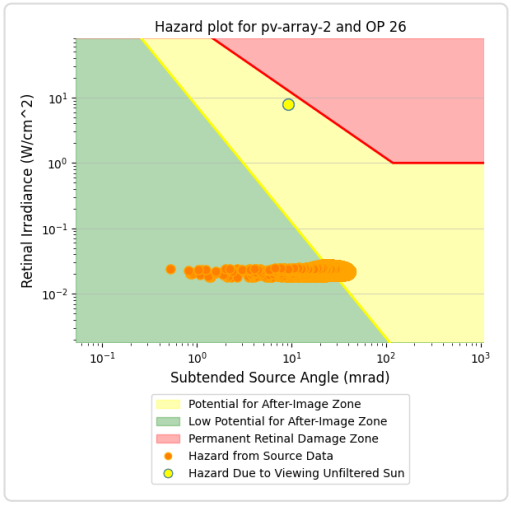
PV array 2 and OP 26

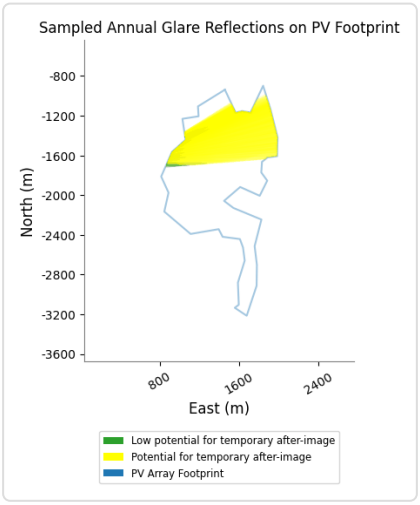
Yellow glare: 3,429 min.

Green glare: 920 min.





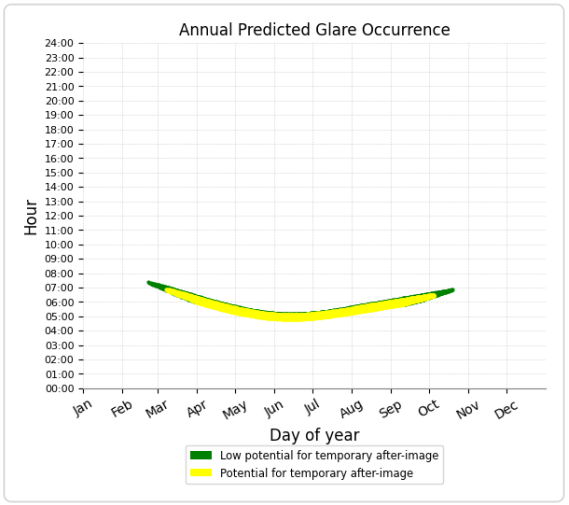


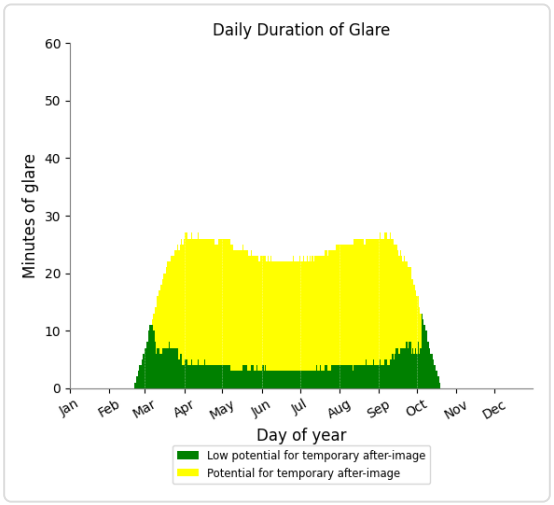


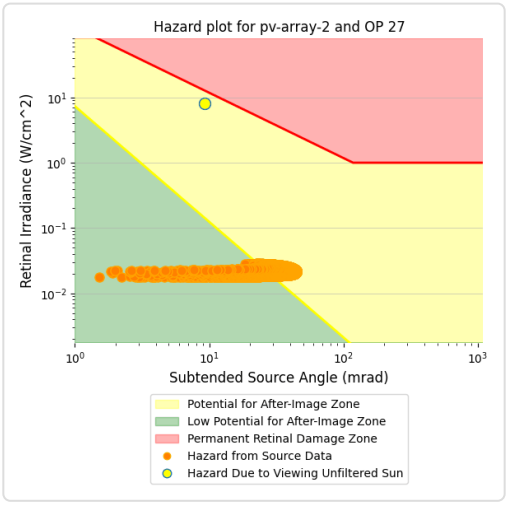
PV array 2 and OP 27

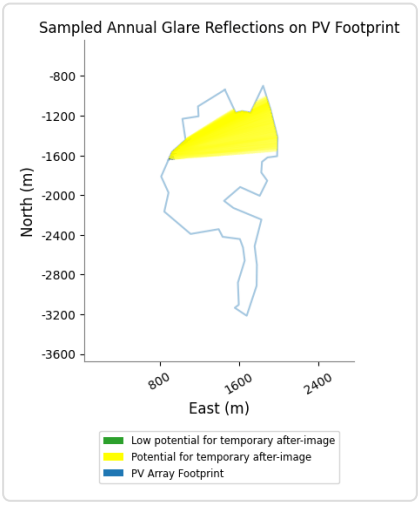
Yellow glare: 4,057 min.

Green glare: 1,112 min.





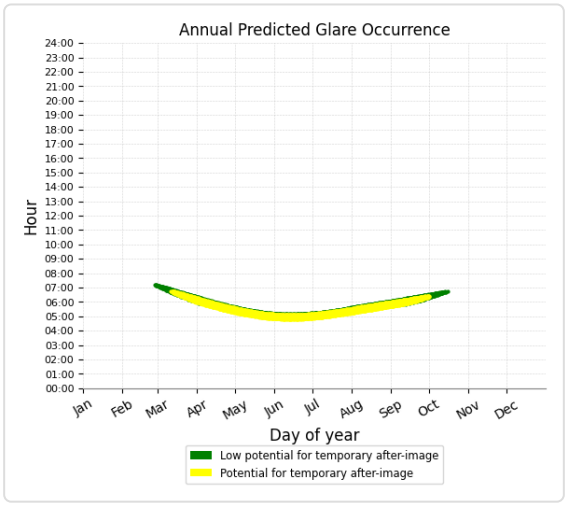


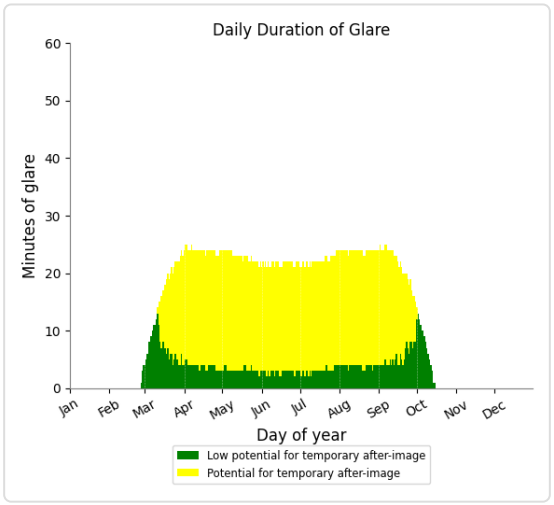


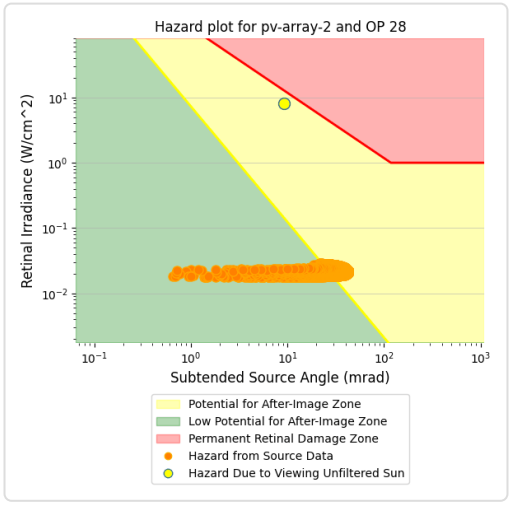
PV array 2 and OP 28

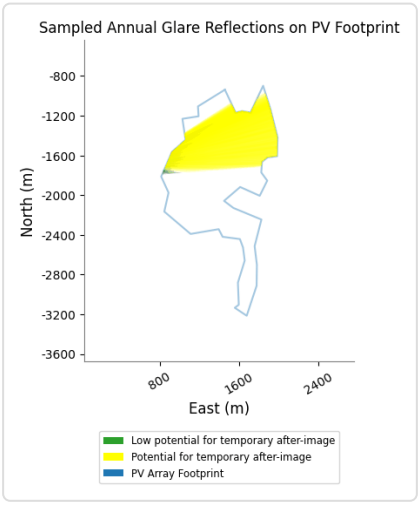
Yellow glare: 3,761 min.

Green glare: 1,008 min.





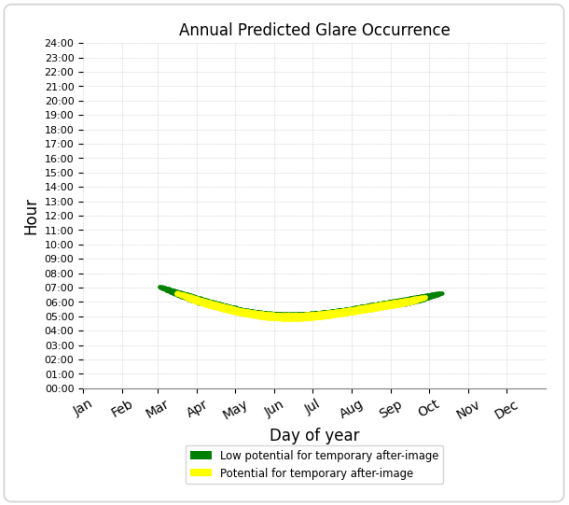


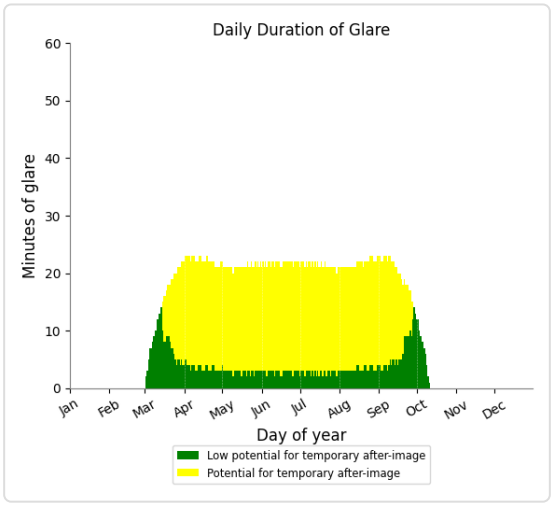


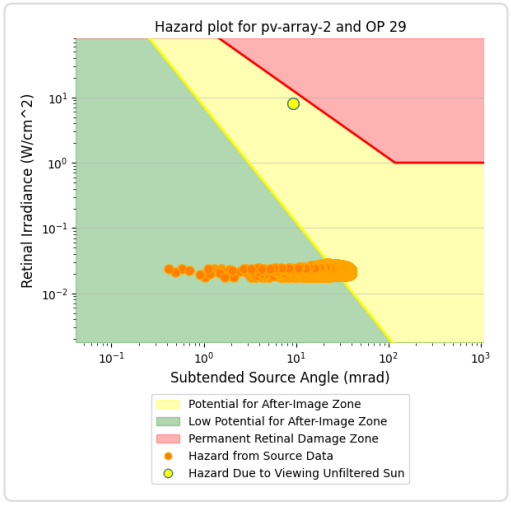
PV array 2 and OP 29

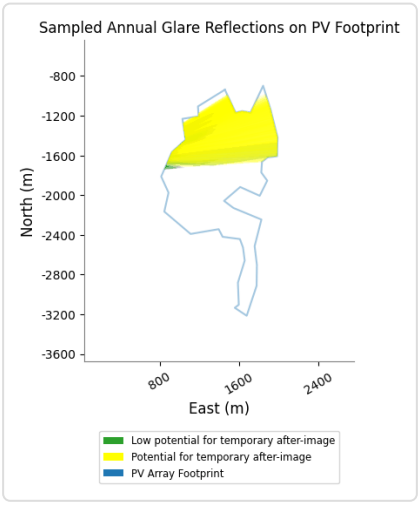
Yellow glare: 3,459 min.

Green glare: 956 min.





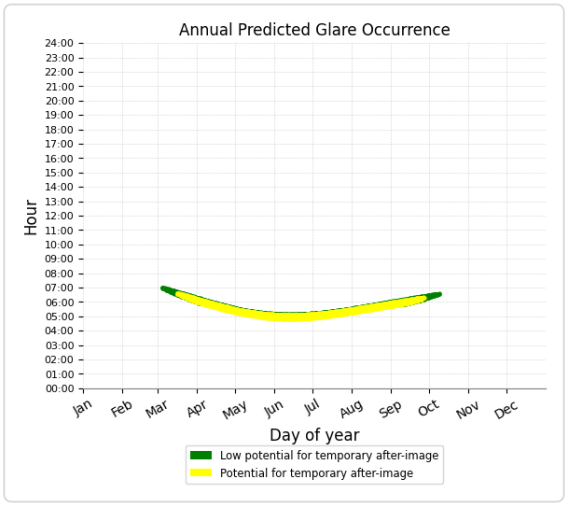


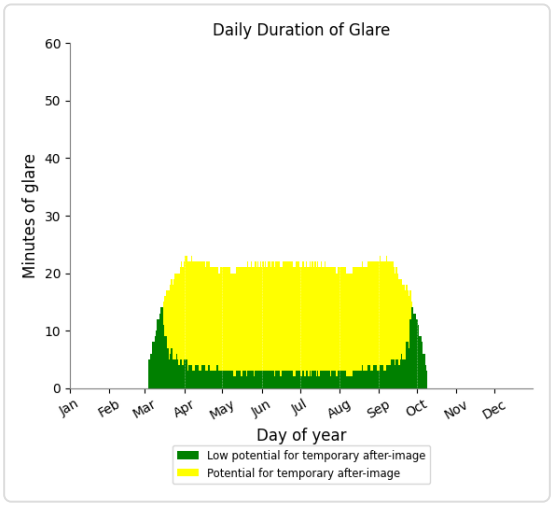


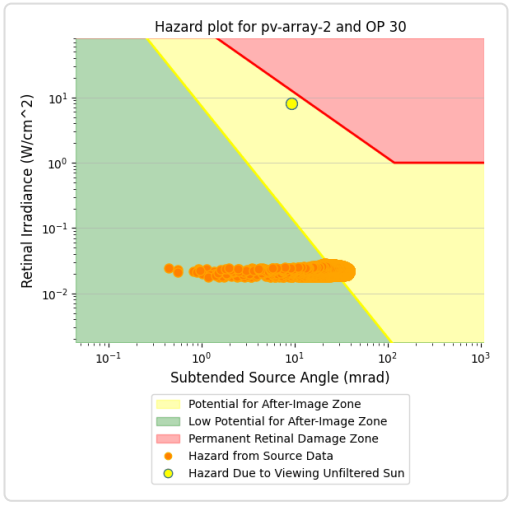
PV array 2 and OP 30

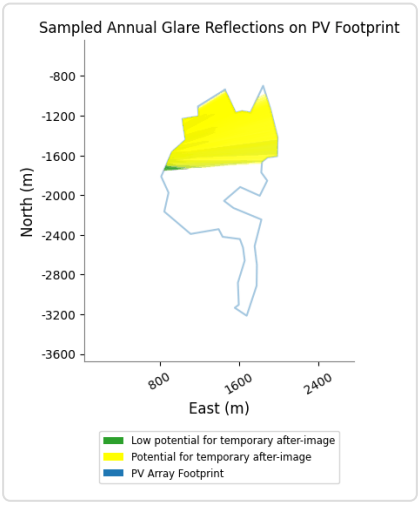
Yellow glare: 3,405 min.

Green glare: 928 min.





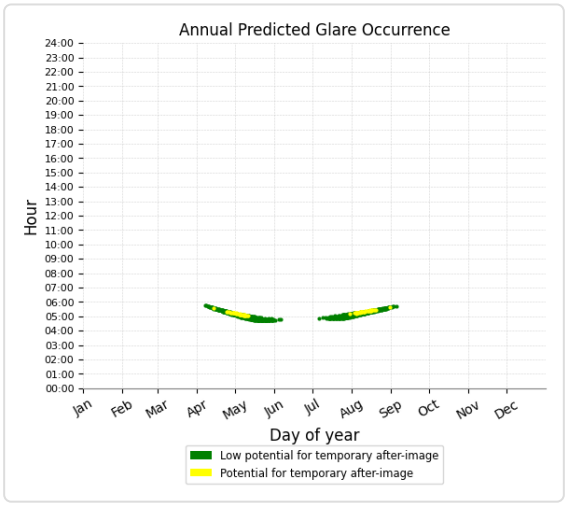


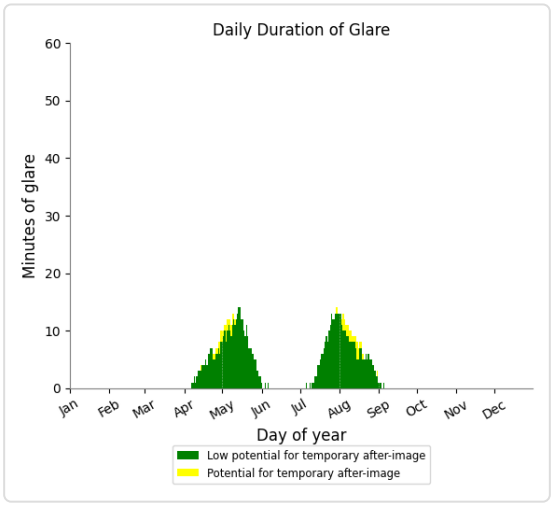


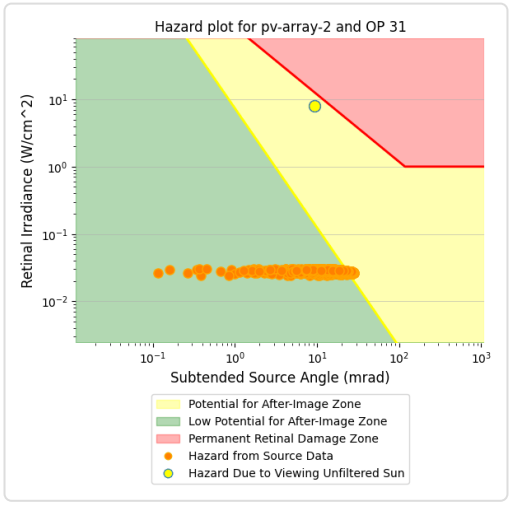
PV array 2 and OP 31

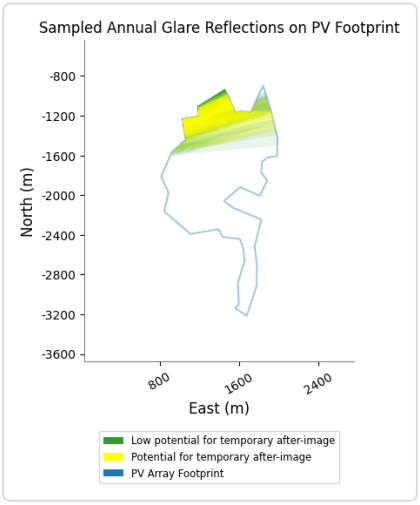
Yellow glare: 59 min.

Green glare: 760 min.





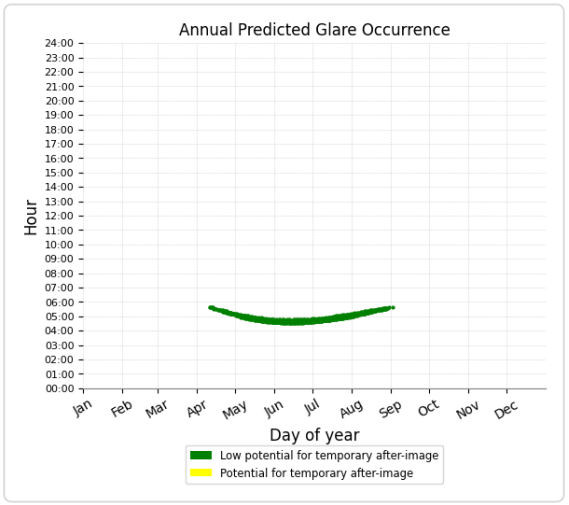


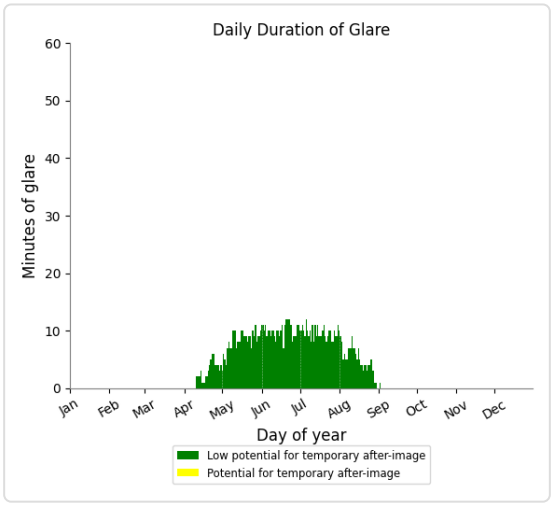


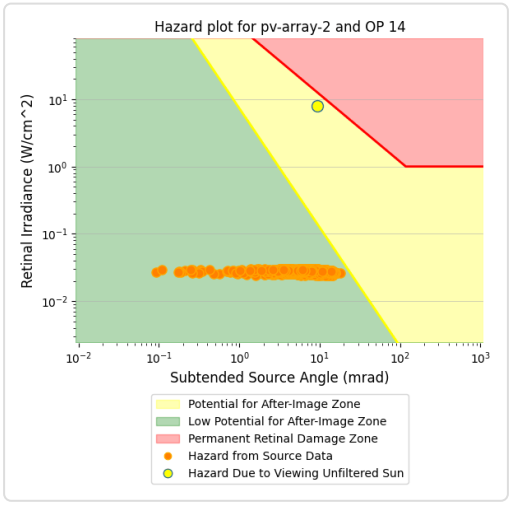
PV array 2 and OP 14

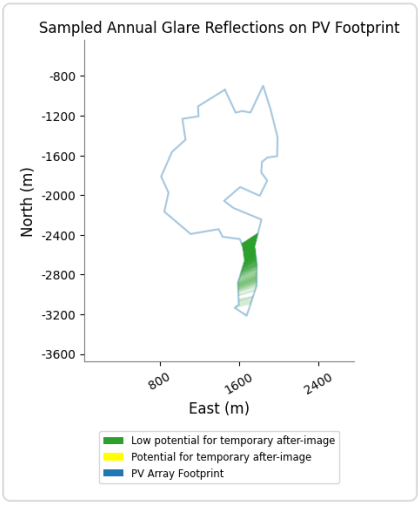
Yellow glare: none

Green glare: 1,076 min.



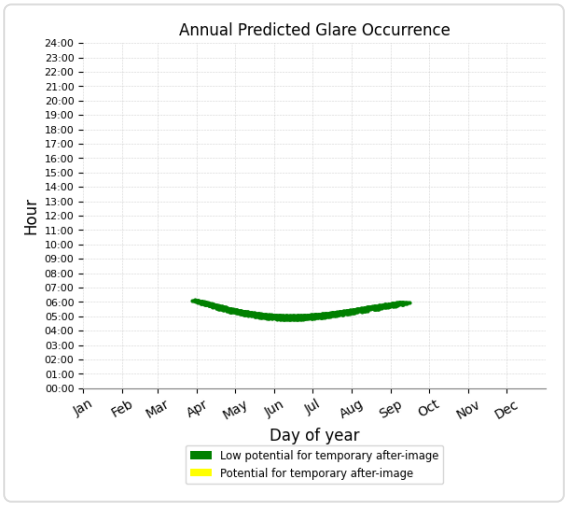


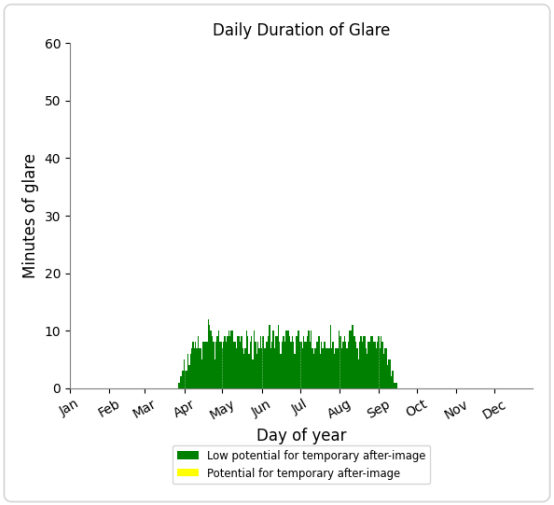


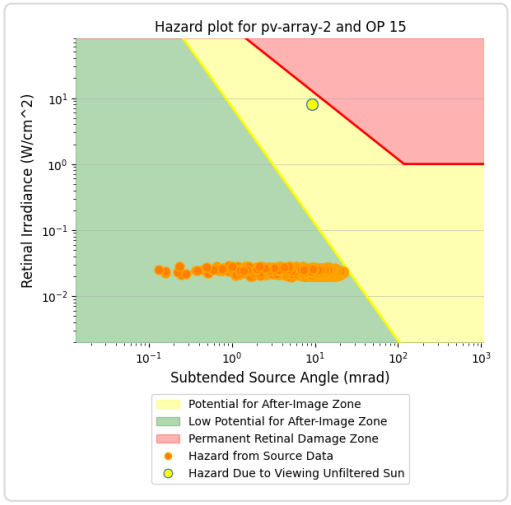


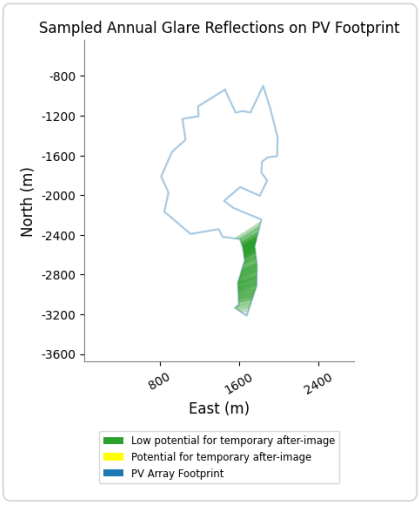
PV array 2 and OP 15

Yellow glare: none
Green glare: 1,313 min.









PV array 2 and OP 1

No glare found

PV array 2 and OP 10

No glare found

PV array 2 and OP 11

No glare found

PV array 2 and OP 12

No glare found

PV array 2 and OP 13

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 32

No glare found

PV array 2 and OP 33

No glare found

PV array 2 and OP 34

No glare found

PV array 2 and OP 35

No glare found

PV array 2 and OP 36

No glare found

PV array 2 and OP 37

No glare found

PV: PV array 3 potential temporary after-image

Receptor results ordered by category of glare

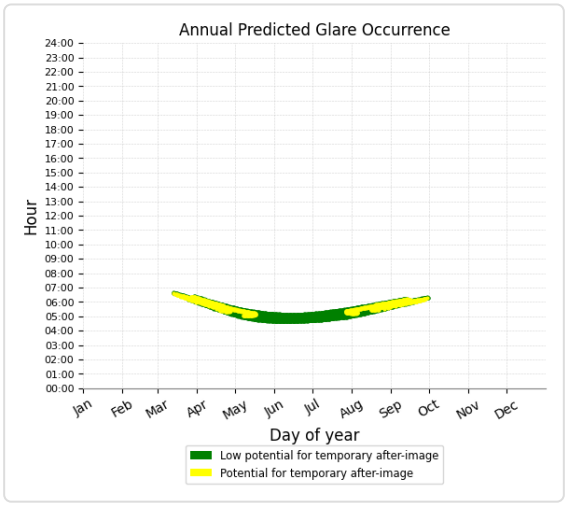
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 5C	4,047	67.5	1,302	21.7
PRoW 6C	950	15.8	7,663	127.7
PRoW 7C	210	3.5	2,734	45.6
Route 4C	2,162	36.0	4,150	69.2
Route 5C	110	1.8	0	0.0
PRoW 1C	0	0.0	0	0.0
PRoW 2C	0	0.0	0	0.0
PRoW 3C	0	0.0	0	0.0
PRoW 4C	0	0.0	0	0.0
PRoW 9C	0	0.0	0	0.0
Route 1C	0	0.0	0	0.0
Route 1C - Part 2	0	0.0	0	0.0
Route 2C	0	0.0	0	0.0
Route 3C	0	0.0	0	0.0
Route 6C	0	0.0	0	0.0
OP 8	1,825	30.4	110	1.8
OP 9	2,248	37.5	523	8.7
OP 10	744	12.4	190	3.2
OP 17	1,809	30.1	1,539	25.6
OP 18	2,934	48.9	3,814	63.6
OP 19	3,590	59.8	1,466	24.4
OP 20	2,222	37.0	695	11.6
OP 22	8,212	136.9	14,706	245.1
OP 7	1,392	23.2	0	0.0
OP 21	930	15.5	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

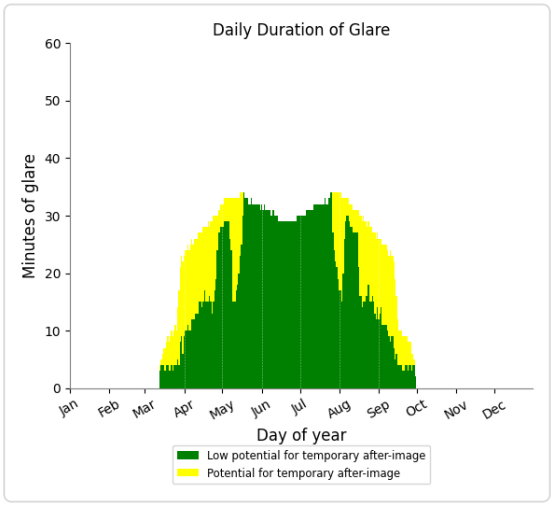
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0

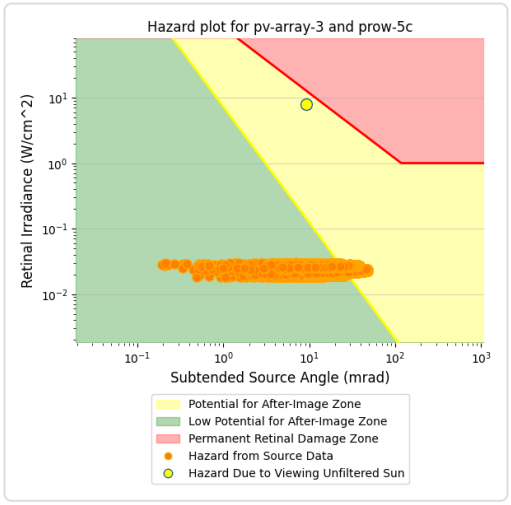
PV array 3 and Route: PRoW 5C

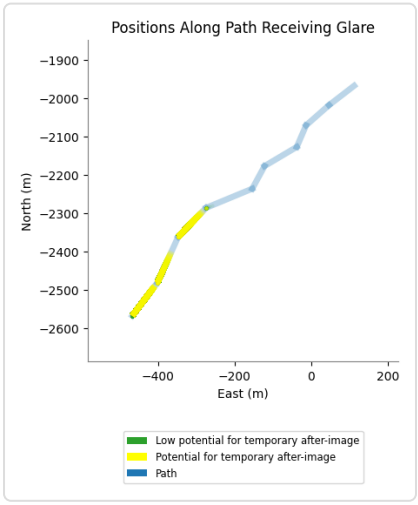
Yellow glare: 1,302 min.

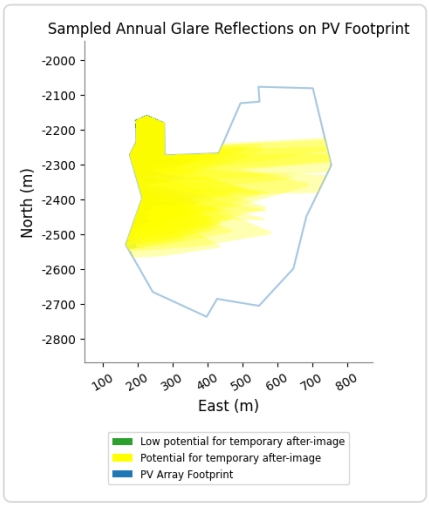
Green glare: 4,047 min.







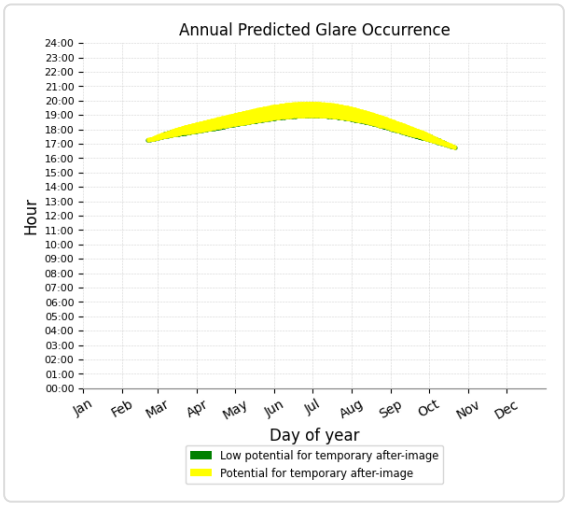


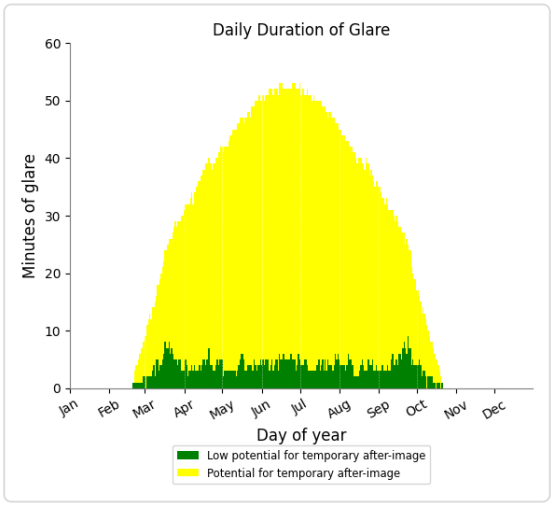


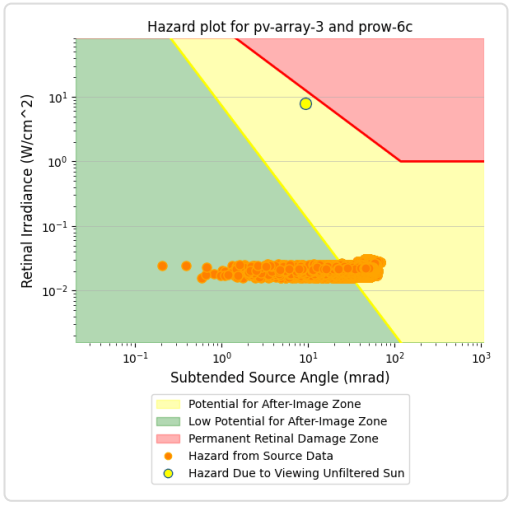
PV array 3 and Route: PRoW 6C

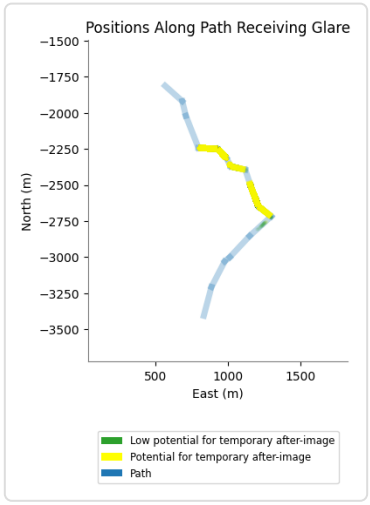
Yellow glare: 7,663 min.

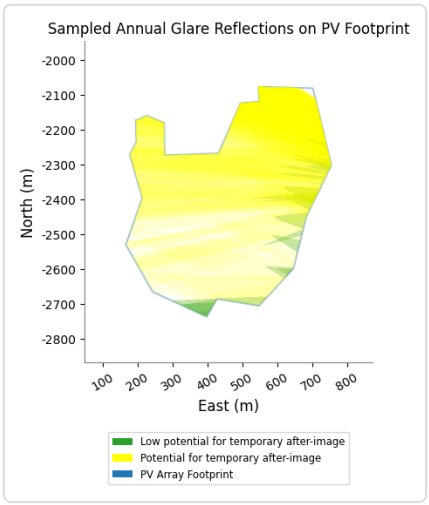
Green glare: 950 min.







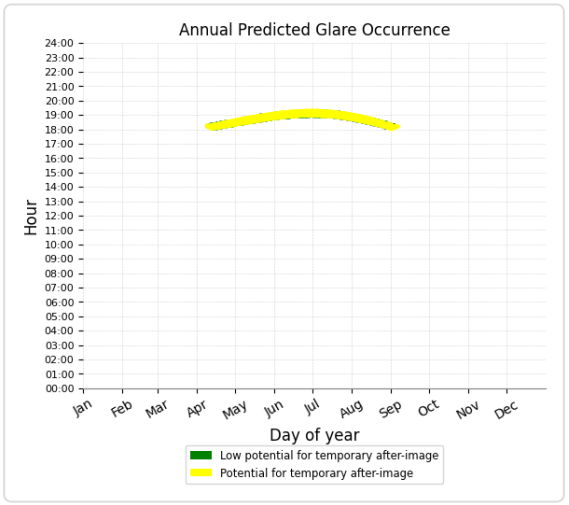


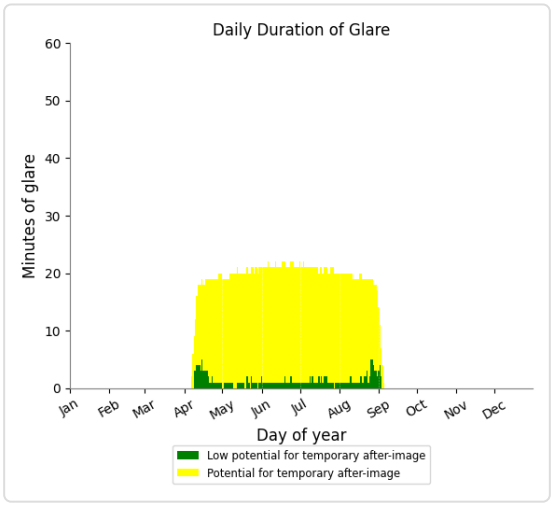


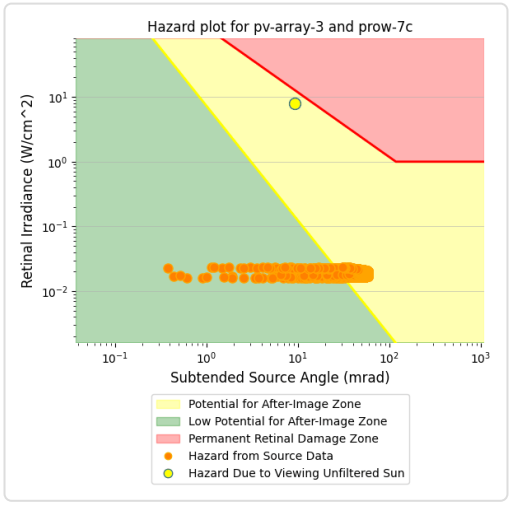
PV array 3 and Route: PRoW 7C

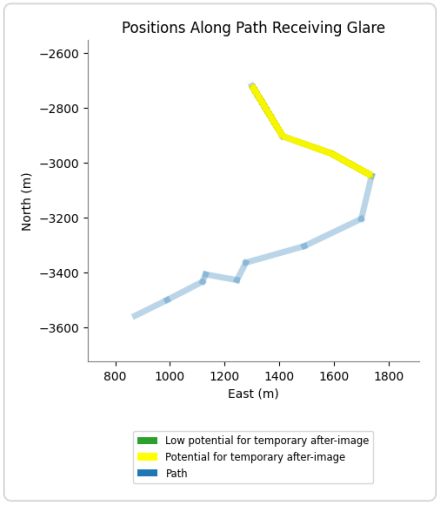
Yellow glare: 2,734 min.

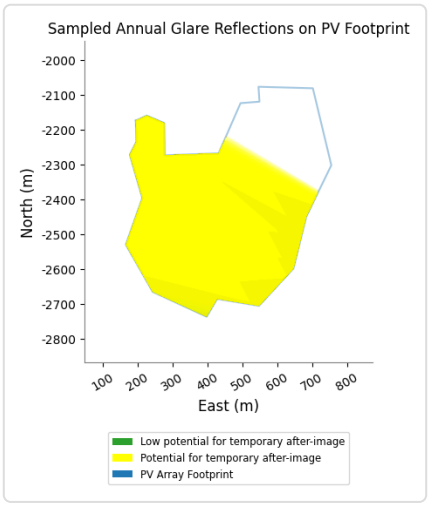
Green glare: 210 min.







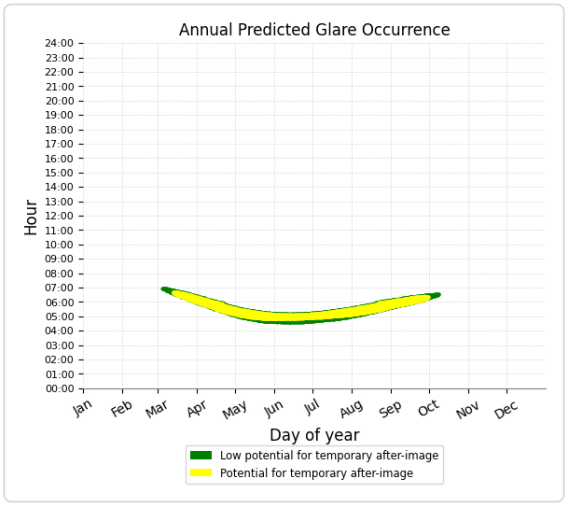


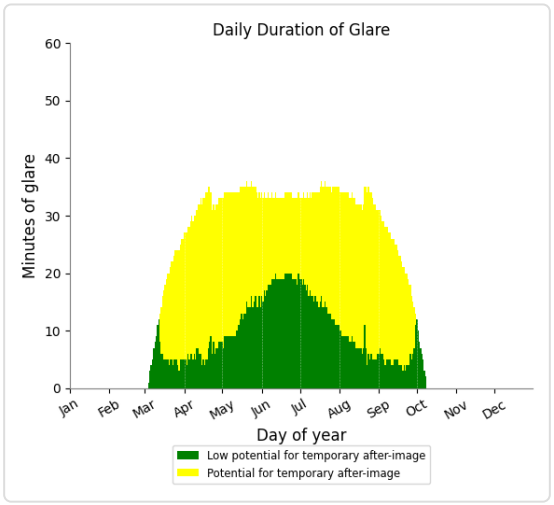


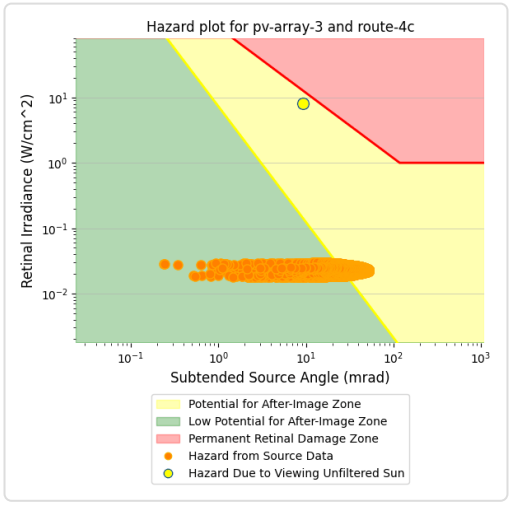
PV array 3 and Route: Route 4C

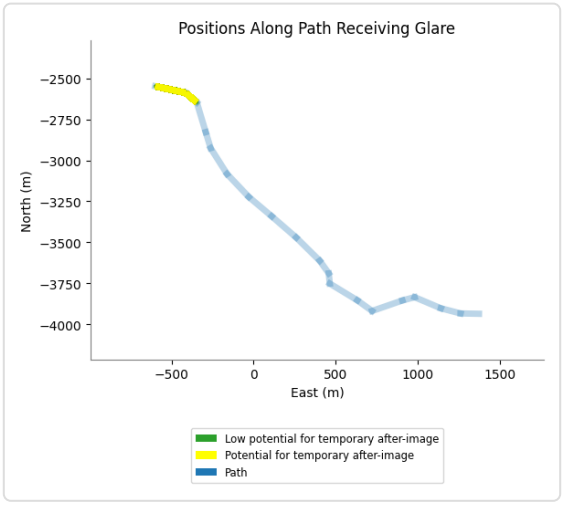
Yellow glare: 4,150 min.

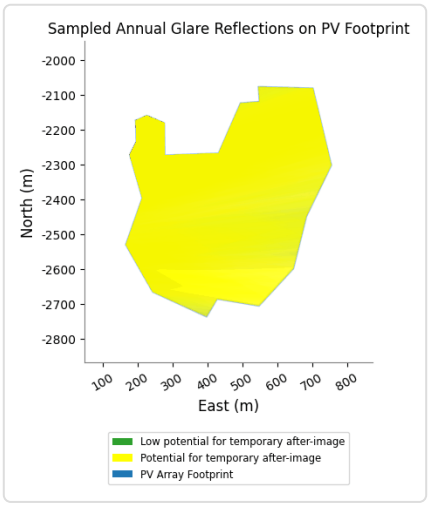
Green glare: 2,162 min.







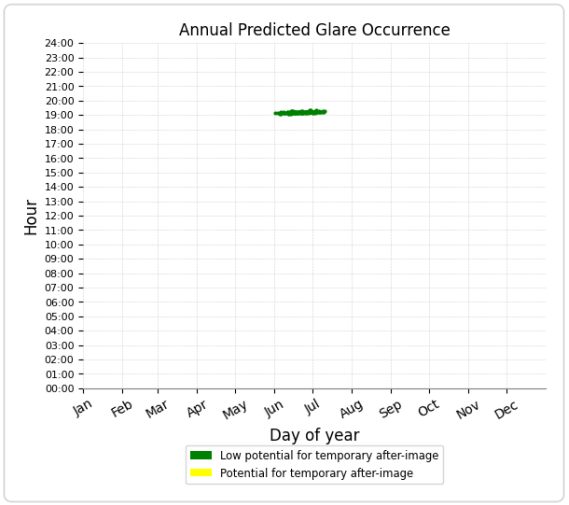


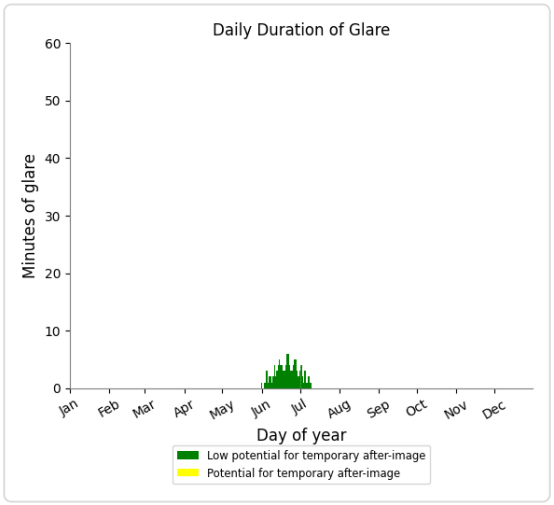


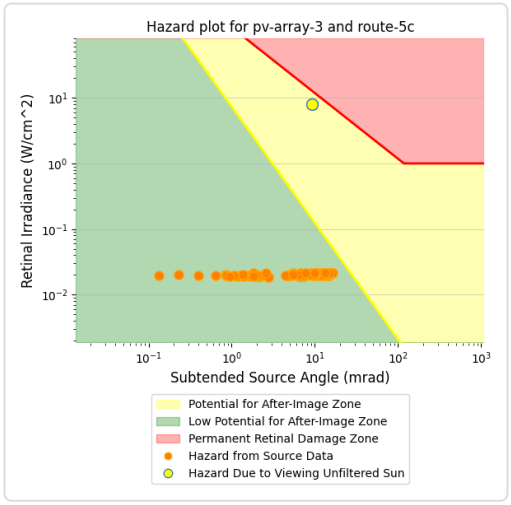
PV array 3 and Route: Route 5C

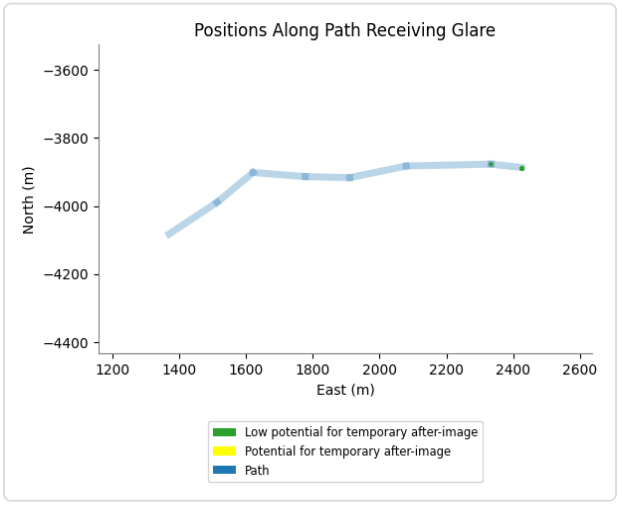
Yellow glare: none

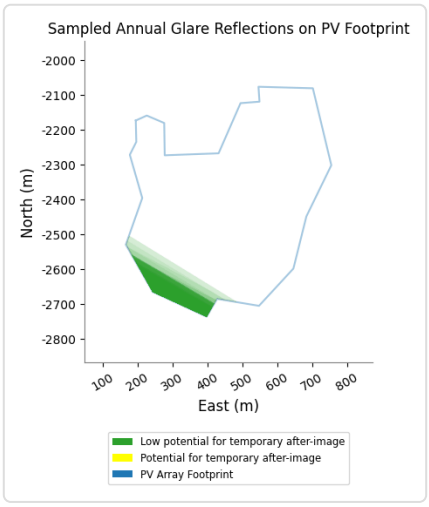
Green glare: 110 min.











PV array 3 and Route: PRoW 1C

No glare found

PV array 3 and Route: PRoW 2C

No glare found

PV array 3 and Route: PRoW 3C

No glare found

PV array 3 and Route: PRoW 4C

No glare found

PV array 3 and Route: PRoW 9C

No glare found

PV array 3 and Route: Route 1C

No glare found

PV array 3 and Route: Route 1C - Part 2

No glare found

PV array 3 and Route: Route 2C

No glare found

PV array 3 and Route: Route 3C

No glare found

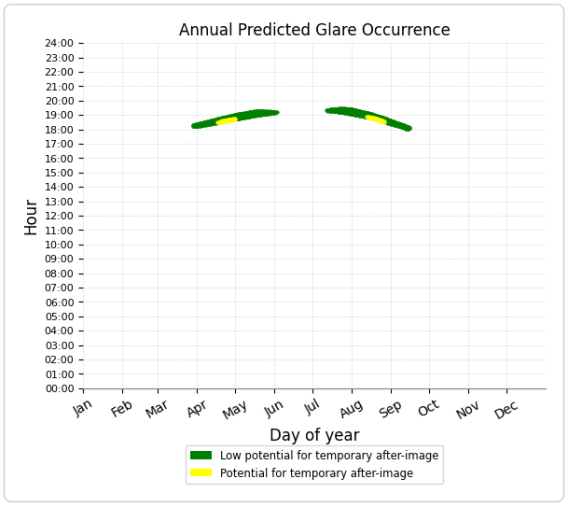
PV array 3 and Route: Route 6C

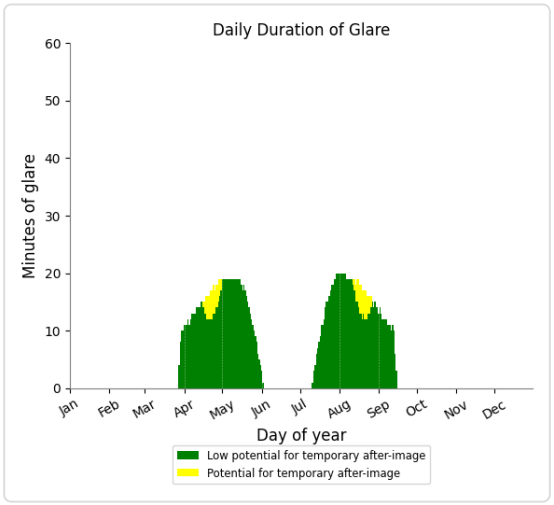
No glare found

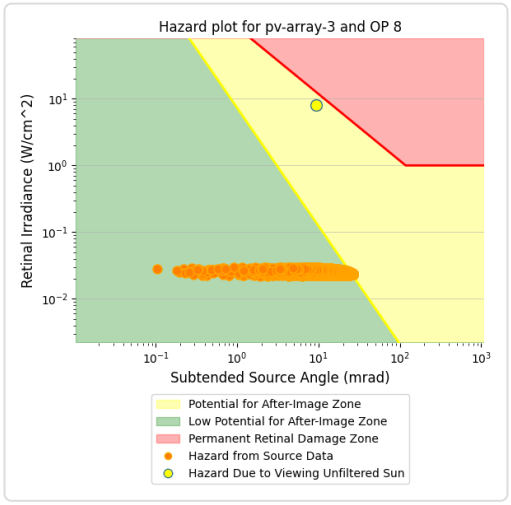
PV array 3 and OP 8

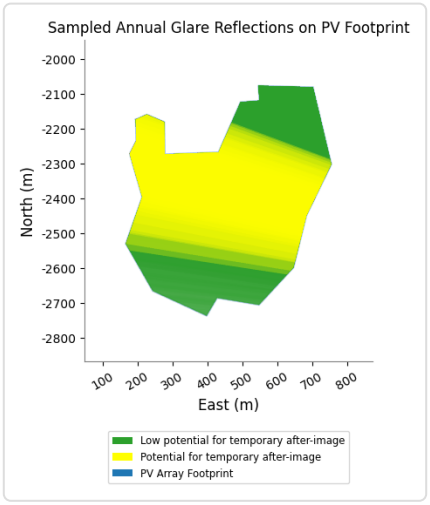
Yellow glare: 110 min.

Green glare: 1,825 min.





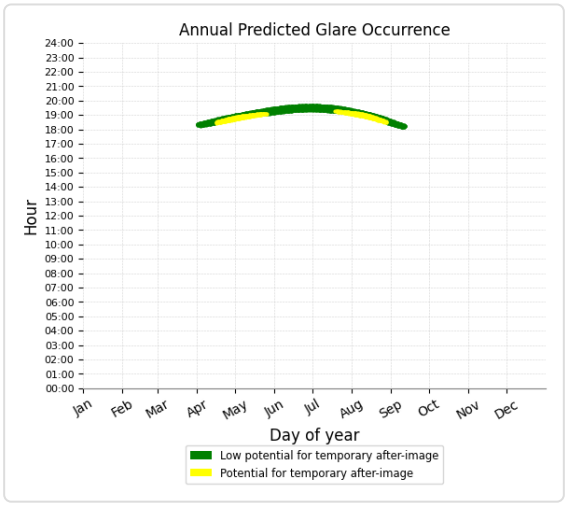


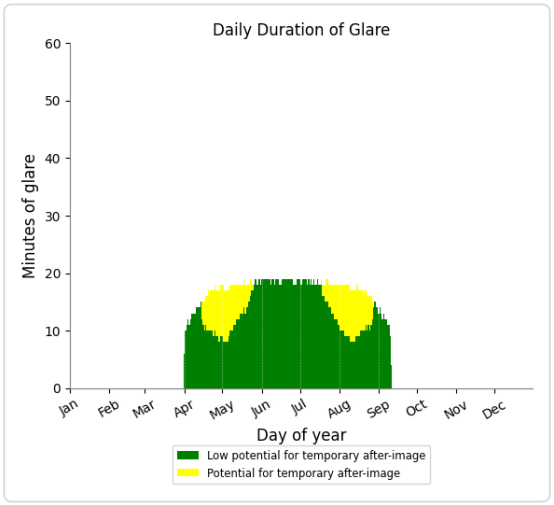


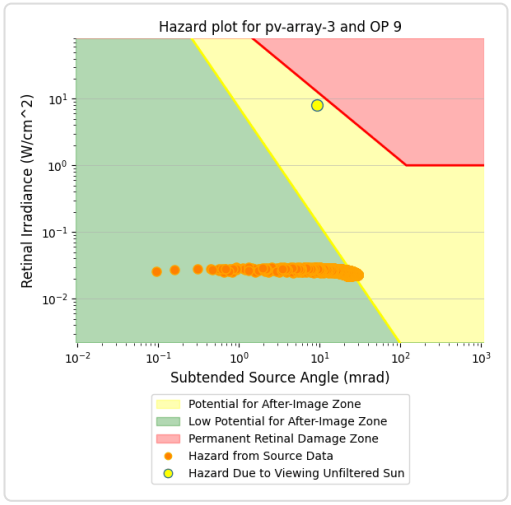
PV array 3 and OP 9

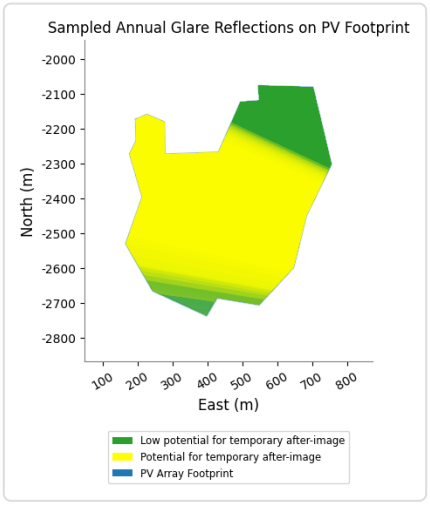
Yellow glare: 523 min.

Green glare: 2,248 min.





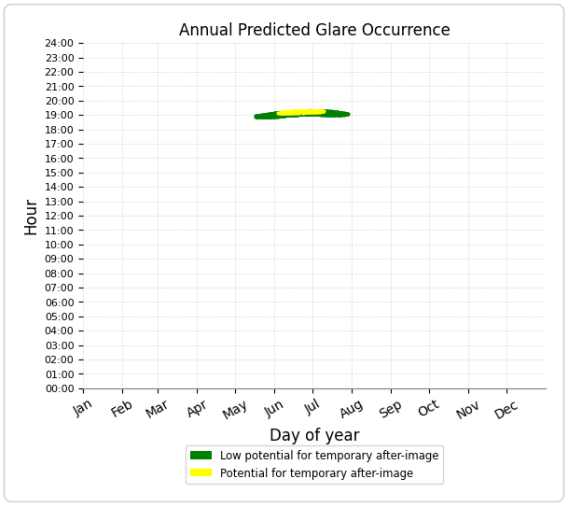


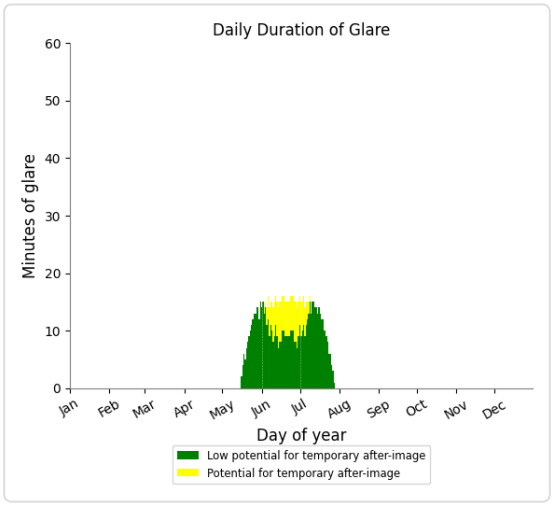


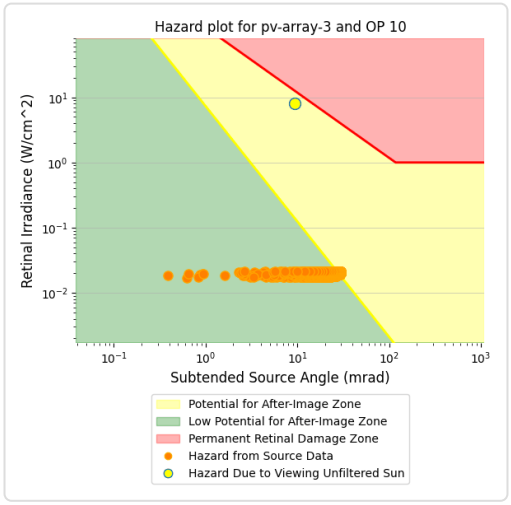
PV array 3 and OP 10

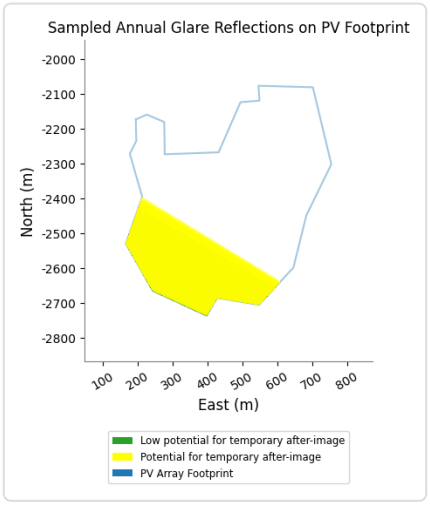
Yellow glare: 190 min.

Green glare: 744 min.





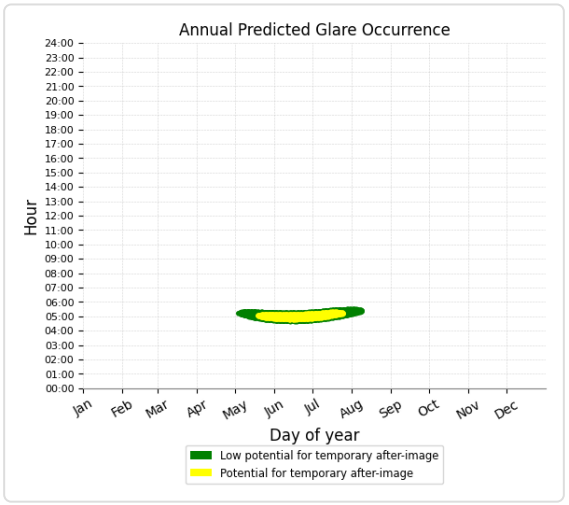


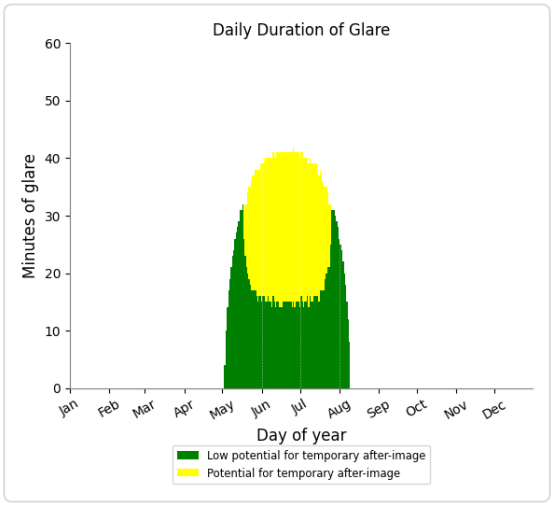


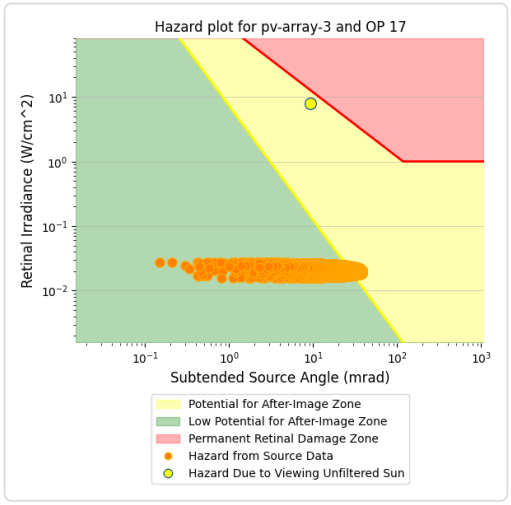
PV array 3 and OP 17

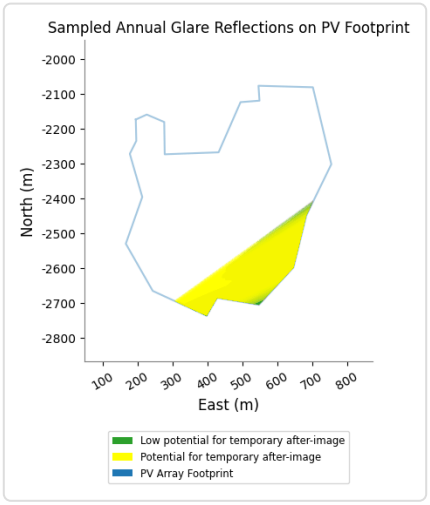
Yellow glare: 1,539 min.

Green glare: 1,809 min.





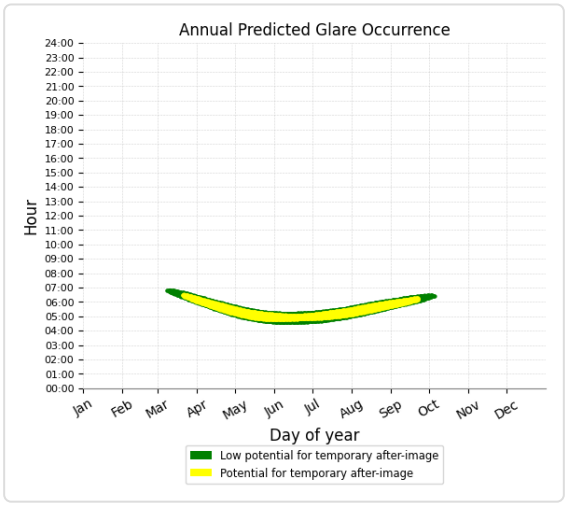


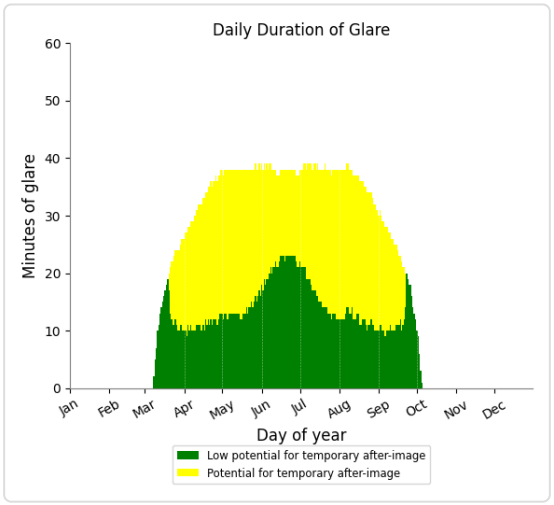


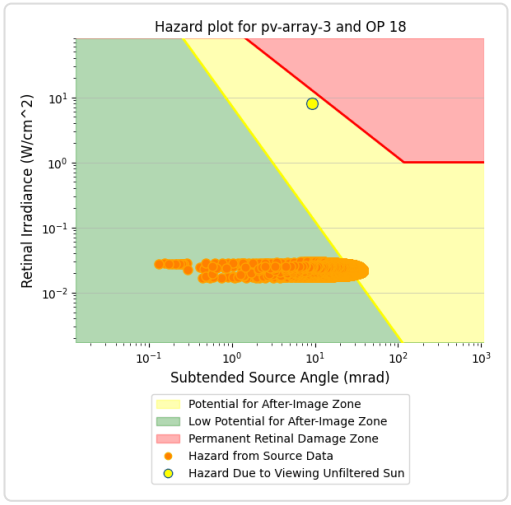
PV array 3 and OP 18

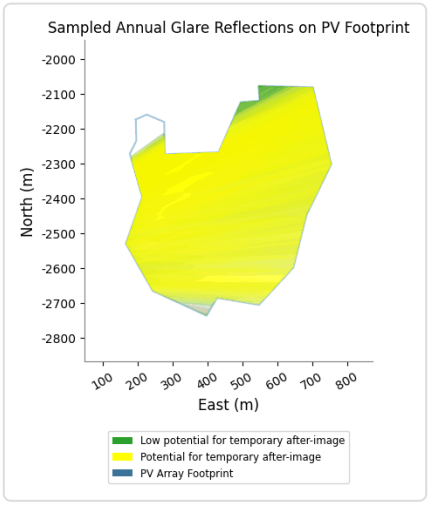
Yellow glare: 3,814 min.

Green glare: 2,934 min.





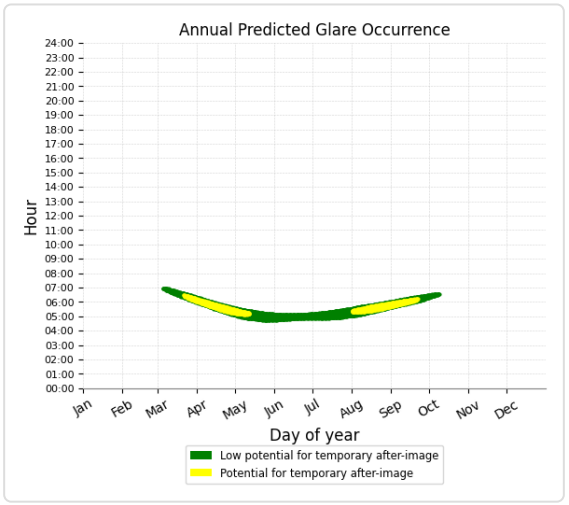


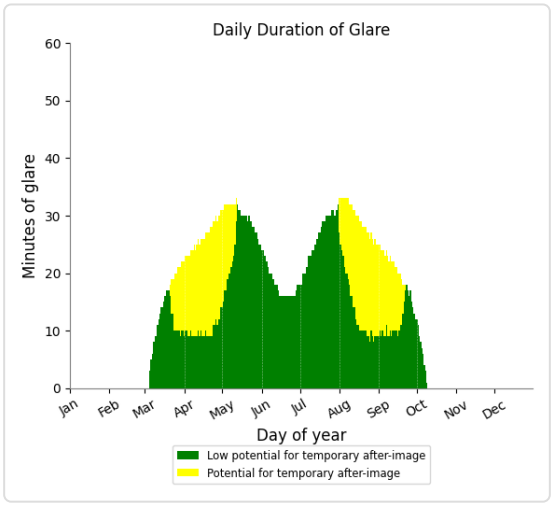


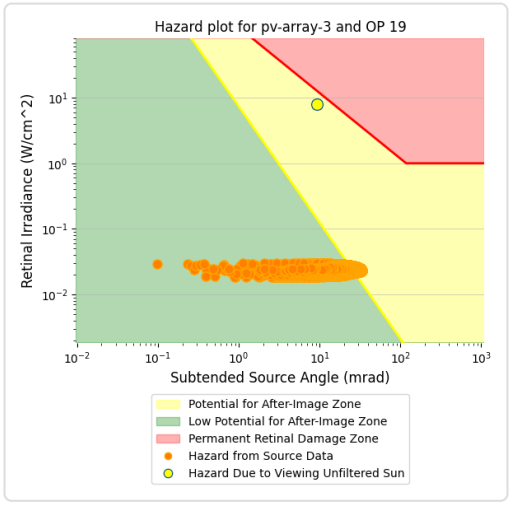
PV array 3 and OP 19

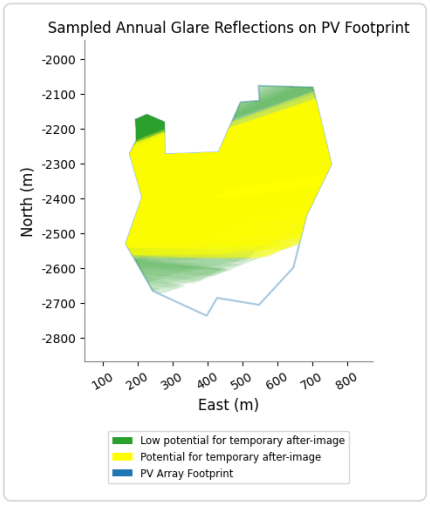
Yellow glare: 1,466 min.

Green glare: 3,590 min.





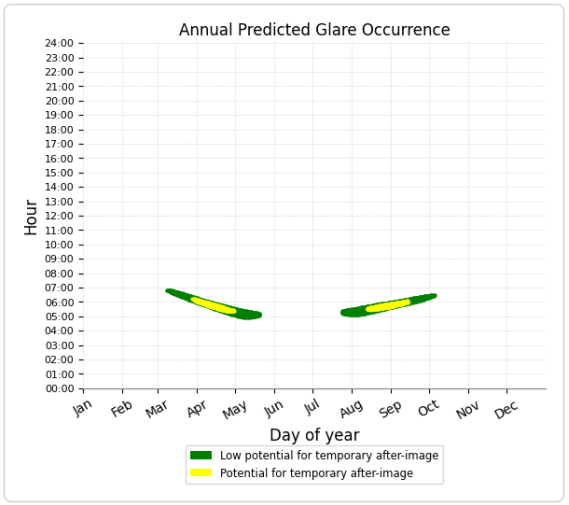


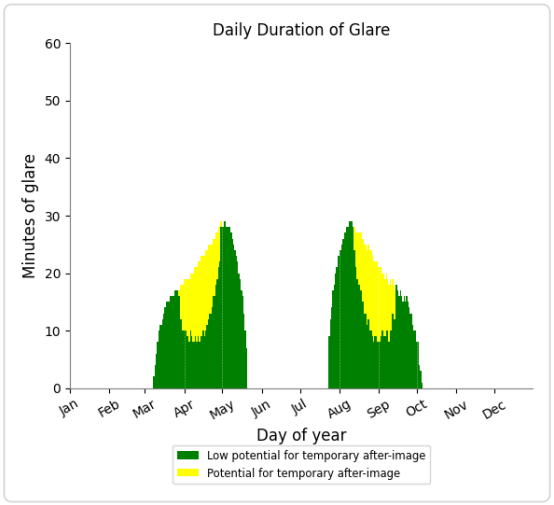


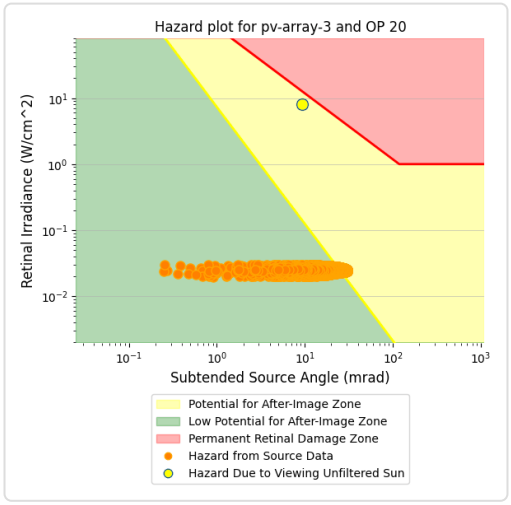
PV array 3 and OP 20

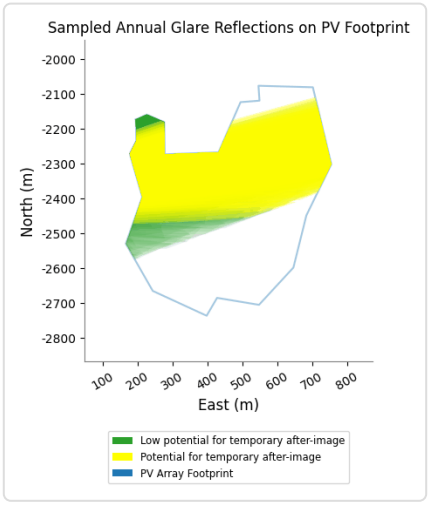
Yellow glare: 695 min.

Green glare: 2,222 min.





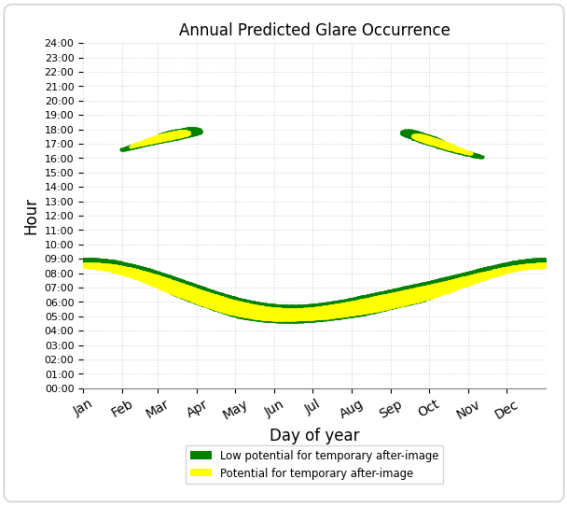


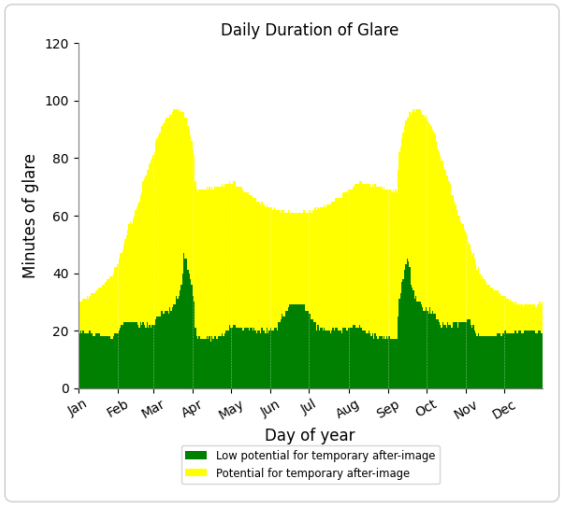


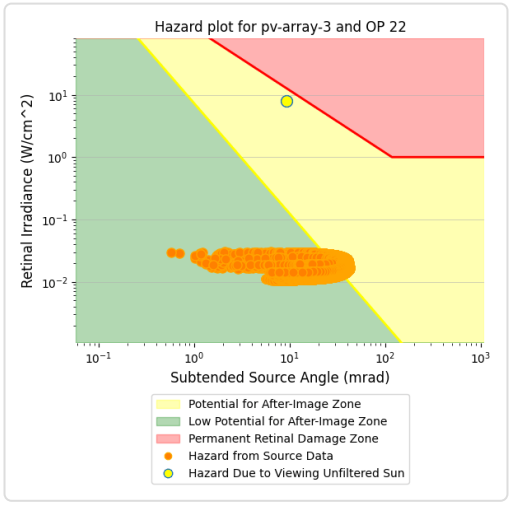
PV array 3 and OP 22

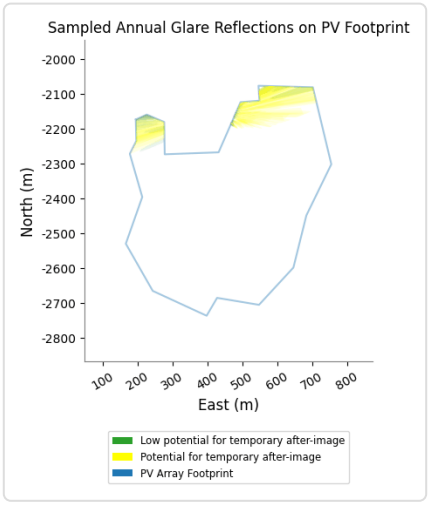
Yellow glare: 14,706 min.

Green glare: 8,212 min.





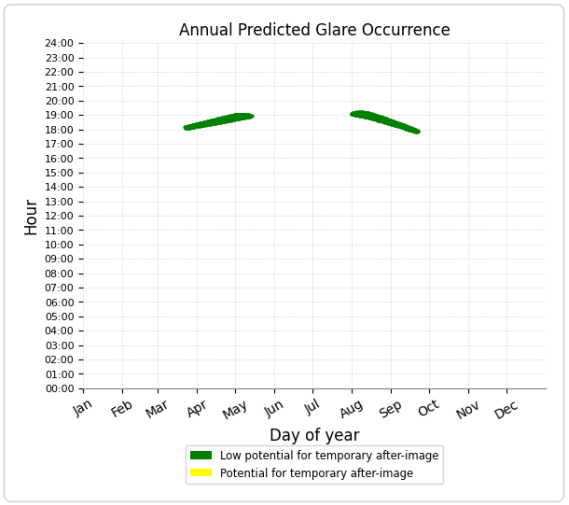


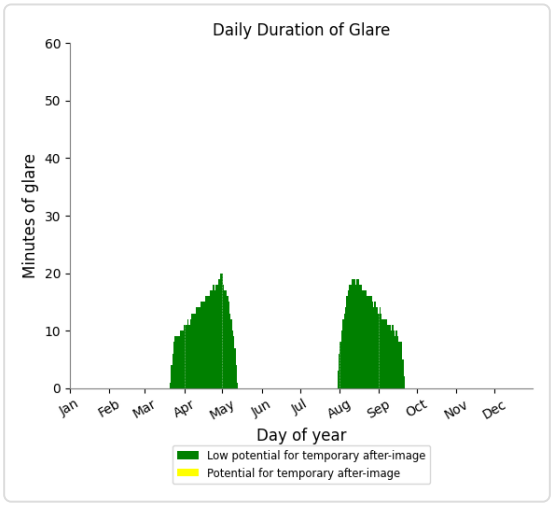


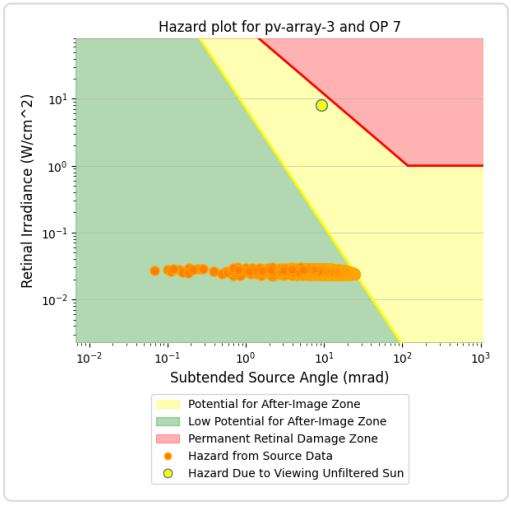
PV array 3 and OP 7

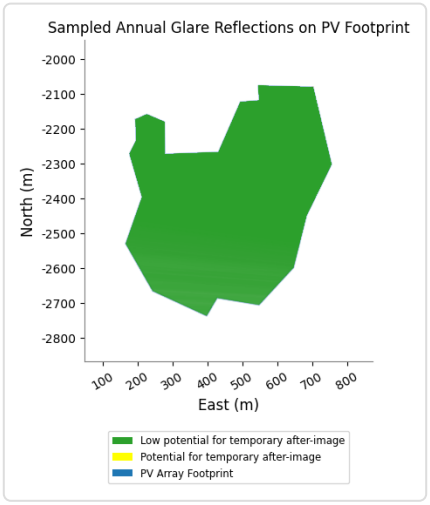
Yellow glare: none

Green glare: 1,392 min.



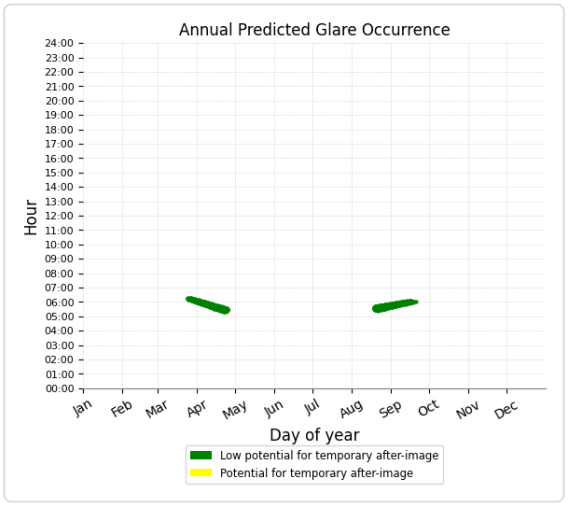


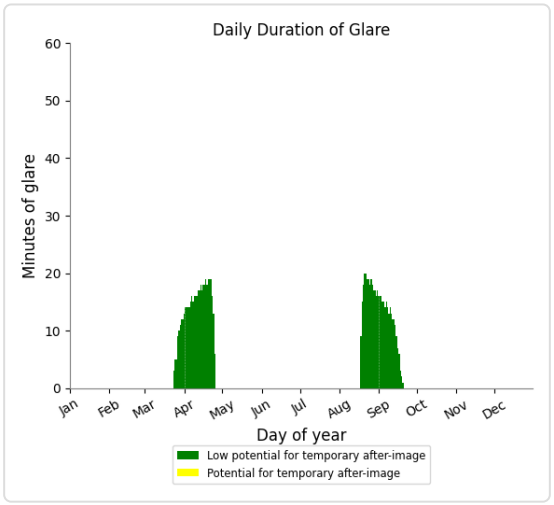


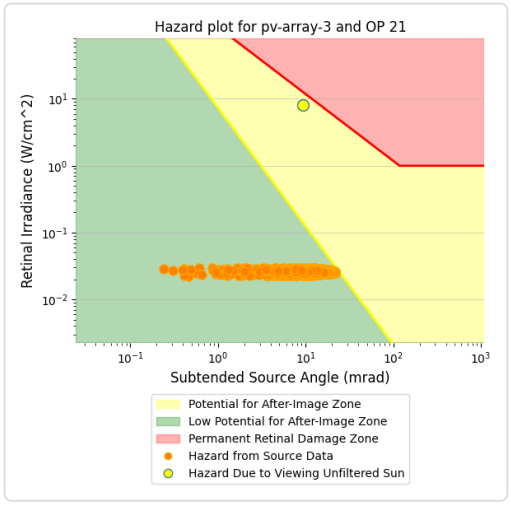


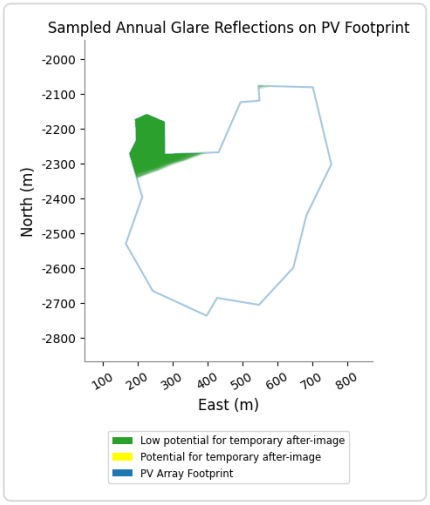
PV array 3 and OP 21

Yellow glare: none
Green glare: 930 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 11

No glare found

PV array 3 and OP 12

No glare found

PV array 3 and OP 13

No glare found

PV array 3 and OP 14

No glare found

PV array 3 and OP 15

No glare found

PV array 3 and OP 16

No glare found

PV array 3 and OP 23

No glare found

PV array 3 and OP 24

No glare found

PV array 3 and OP 25

No glare found

PV array 3 and OP 26

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 29

No glare found

PV array 3 and OP 30

No glare found

PV array 3 and OP 31

No glare found

PV array 3 and OP 32

No glare found

PV array 3 and OP 33

No glare found

PV array 3 and OP 34

No glare found

PV array 3 and OP 35

No glare found

PV array 3 and OP 36

No glare found

PV array 3 and OP 37

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone**
Site configuration: **W2C**

Created 04 Jul, 2025
Updated 04 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 153918.25317

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	248,851	4,147.5	96,748	1,612.5	-
PV array 2	25.0	180.0	209,025	3,483.8	117,546	1,959.1	-
PV array 3	25.0	180.0	20,629	343.8	36,790	613.2	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1C	93,404	1,556.7	31,019	517.0
PRoW 2C	132,918	2,215.3	41,630	693.8
PRoW 3C	2,266	37.8	7,374	122.9
PRoW 4C	7	0.1	55	0.9
PRoW 5C	3,896	64.9	4,960	82.7
PRoW 6C	48,267	804.5	23,672	394.5
PRoW 7C	137,878	2,298.0	50,564	842.7
PRoW 9C	2,876	47.9	1,128	18.8
Route 1C	3,818	63.6	5,250	87.5
Route 1C - Part 2	4,537	75.6	5,246	87.4
Route 2C	0	0.0	0	0.0
Route 3C	830	13.8	4,519	75.3
Route 4C	2,029	33.8	5,663	94.4
Route 5C	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 6C	59	1.0	1	0.0
OP 1	411	6.8	497	8.3
OP 2	1,561	26.0	3,089	51.5
OP 3	2,015	33.6	1,795	29.9
OP 4	1,813	30.2	1,787	29.8
OP 5	2,082	34.7	1,482	24.7
OP 6	441	7.3	2,395	39.9
OP 7	2,505	41.8	1,409	23.5
OP 8	2,695	44.9	1,648	27.5
OP 9	977	16.3	3,103	51.7
OP 10	132	2.2	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	1,172	19.5	0	0.0
OP 15	1,319	22.0	0	0.0
OP 16	1,530	25.5	0	0.0
OP 17	3,139	52.3	428	7.1
OP 18	2,614	43.6	4,467	74.5
OP 19	2,757	46.0	3,224	53.7
OP 20	2,349	39.1	1,605	26.8
OP 21	1,366	22.8	1,704	28.4
OP 22	4,265	71.1	10,161	169.3
OP 23	613	10.2	2,681	44.7
OP 24	772	12.9	3,414	56.9
OP 25	652	10.9	2,903	48.4
OP 26	568	9.5	2,678	44.6
OP 27	727	12.1	3,063	51.0
OP 28	656	10.9	2,882	48.0
OP 29	591	9.8	2,664	44.4
OP 30	585	9.8	2,632	43.9
OP 31	564	9.4	1,032	17.2
OP 32	468	7.8	1,569	26.1
OP 33	1,647	27.4	702	11.7
OP 34	857	14.3	3,698	61.6
OP 35	711	11.8	183	3.0
OP 36	132	2.2	0	0.0
OP 37	1,034	17.2	1,108	18.5

Component Data

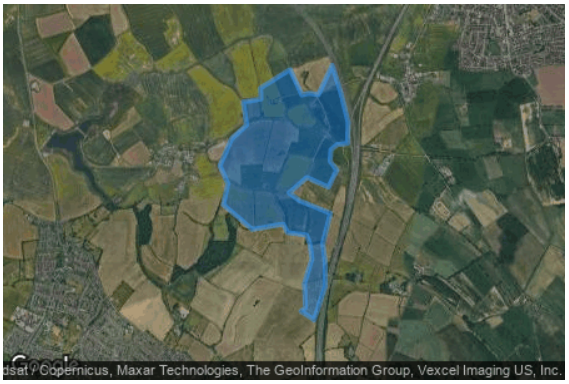
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



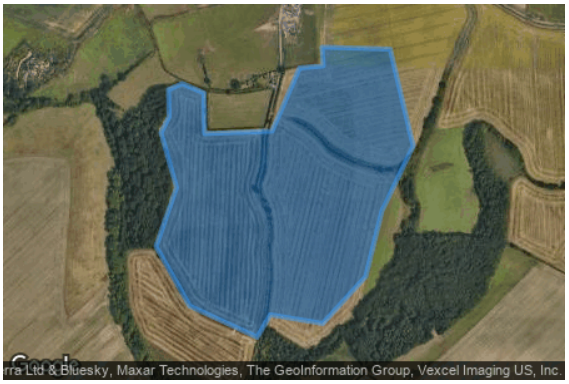
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.397918	-1.309154	92.10	3.80	95.90
2	53.397073	-1.296537	102.80	3.80	106.60
3	53.396536	-1.296494	102.00	3.80	105.80
4	53.396229	-1.299069	102.80	3.80	106.60
5	53.391239	-1.296150	67.30	3.80	71.10
6	53.389370	-1.301858	62.40	3.80	66.20
7	53.389217	-1.304691	61.00	3.80	64.80
8	53.390010	-1.305721	63.60	3.80	67.40
9	53.391187	-1.306965	72.50	3.80	76.30
10	53.389959	-1.310012	76.40	3.80	80.20
11	53.391008	-1.311385	90.20	3.80	94.00
12	53.392032	-1.310441	89.90	3.80	93.70
13	53.395359	-1.304734	101.50	3.80	105.30
14	53.395768	-1.305034	103.10	3.80	106.90
15	53.395845	-1.306836	102.70	3.80	106.50

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.389486	-1.287224	97.30	3.80	101.10
2	53.387975	-1.291301	99.40	3.80	103.20
3	53.387080	-1.291215	101.60	3.80	105.40
4	53.386849	-1.293661	101.10	3.80	104.90
5	53.384955	-1.293189	99.20	3.80	103.00
6	53.383855	-1.295249	99.00	3.80	102.80
7	53.381628	-1.296880	95.80	3.80	99.60
8	53.380168	-1.295764	94.10	3.80	97.90
9	53.378453	-1.296408	91.70	3.80	95.50
10	53.376431	-1.292417	110.90	3.80	114.70
11	53.376866	-1.288168	106.30	3.80	110.10
12	53.376175	-1.287567	109.00	3.80	112.80
13	53.375970	-1.284950	106.00	3.80	109.80
14	53.375202	-1.284477	108.70	3.80	112.50
15	53.374024	-1.284220	113.80	3.80	117.60
16	53.372027	-1.285250	116.60	3.80	120.40
17	53.370030	-1.285121	119.50	3.80	123.30
18	53.369748	-1.285722	116.70	3.80	120.50
19	53.369031	-1.283920	114.90	3.80	118.70
20	53.371746	-1.282418	112.20	3.80	116.00
21	53.373640	-1.282375	112.10	3.80	115.90
22	53.375330	-1.282718	112.10	3.80	115.90
23	53.377736	-1.281688	105.00	3.80	108.80
24	53.378786	-1.285937	99.20	3.80	103.00
25	53.379426	-1.287353	98.10	3.80	101.90
26	53.380680	-1.284907	99.80	3.80	103.60
27	53.379887	-1.281945	103.70	3.80	107.50
28	53.381256	-1.280808	105.00	3.80	108.80
29	53.381999	-1.281709	102.10	3.80	105.90
30	53.382959	-1.281602	103.70	3.80	107.50
31	53.383355	-1.280765	106.00	3.80	109.80
32	53.383471	-1.279306	110.50	3.80	114.30
33	53.385186	-1.279242	116.20	3.80	120.00
34	53.387732	-1.280315	113.40	3.80	117.20
35	53.389844	-1.281430	103.60	3.80	107.40
36	53.387425	-1.283340	111.20	3.80	115.00
37	53.387553	-1.284606	108.40	3.80	112.20
38	53.387412	-1.285593	107.70	3.80	111.50

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.378389	-1.306214	83.40	3.80	87.20
2	53.377839	-1.306193	82.00	3.80	85.80
3	53.377506	-1.306472	80.00	3.80	83.80
4	53.376392	-1.305935	83.20	3.80	87.00
5	53.375189	-1.306643	79.10	3.80	82.90
6	53.373973	-1.305485	82.90	3.80	86.70
7	53.373333	-1.303167	79.20	3.80	83.00
8	53.373794	-1.302716	81.50	3.80	85.30
9	53.373615	-1.300914	78.50	3.80	82.30
10	53.374575	-1.299433	86.00	3.80	89.80
11	53.375919	-1.298876	92.80	3.80	96.60
12	53.377237	-1.297803	90.80	3.80	94.60
13	53.379221	-1.298597	103.00	3.80	106.80
14	53.379260	-1.300936	111.80	3.80	115.60
15	53.378876	-1.300893	111.70	3.80	115.50
16	53.378837	-1.301708	108.10	3.80	111.90
17	53.377544	-1.302652	103.20	3.80	107.00
18	53.377493	-1.304970	90.00	3.80	93.80
19	53.378325	-1.304991	91.60	3.80	95.40
20	53.378517	-1.305742	86.60	3.80	90.40

Route Receptors

Name: PRoW 1C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.392373	-1.309987	88.60	2.70	91.30
2	53.390857	-1.308496	81.40	2.80	84.20
3	53.389449	-1.306672	60.50	2.80	63.30
4	53.387690	-1.305846	68.10	2.80	70.90
5	53.386116	-1.304451	78.60	2.80	81.40
6	53.384375	-1.303485	98.10	2.80	100.90
7	53.382807	-1.303045	111.30	2.70	114.00

Name: PRoW 2C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395630	-1.304379	102.90	2.80	105.70
2	53.394063	-1.303167	92.60	2.80	95.40
3	53.392335	-1.302051	81.90	2.80	84.70
4	53.391689	-1.302104	75.70	2.80	78.50
5	53.390410	-1.300388	68.20	2.80	71.00
6	53.389203	-1.298163	75.60	2.80	78.40
7	53.388166	-1.295781	94.40	2.70	97.10
8	53.386950	-1.293786	101.20	2.70	103.90
9	53.385031	-1.293507	99.70	2.70	102.40

Name: PRoW 3C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.396192	-1.294620	99.30	2.70	102.00
2	53.396058	-1.293204	96.50	2.70	99.20
3	53.394362	-1.292002	81.70	2.70	84.40
4	53.393966	-1.289578	89.70	2.80	92.50
5	53.392187	-1.289385	70.20	2.80	73.00
6	53.390677	-1.291123	84.70	2.70	87.40
7	53.389193	-1.292517	92.00	2.70	94.70
8	53.387900	-1.293311	99.20	2.70	101.90
9	53.386953	-1.293805	101.20	2.70	103.90

Name: PRoW 4C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.384848	-1.314340	55.00	2.70	57.70
2	53.383530	-1.312258	85.70	2.70	88.40
3	53.383376	-1.311625	87.80	2.70	90.50
4	53.382973	-1.311357	85.10	2.70	87.80
5	53.381546	-1.309158	89.70	2.70	92.40

Name: PRoW 5C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.374852	-1.316176	92.30	2.70	95.00
2	53.375629	-1.315189	87.40	2.80	90.20
3	53.376701	-1.314374	77.10	2.80	79.90
4	53.377380	-1.313279	64.50	2.70	67.20
5	53.377828	-1.311466	56.90	2.70	59.60
6	53.378359	-1.310983	58.40	2.70	61.10
7	53.378807	-1.309717	65.00	2.70	67.70
8	53.379313	-1.309353	72.80	2.70	75.50
9	53.379786	-1.308451	79.50	2.80	82.30
10	53.380241	-1.307464	87.30	2.80	90.10

Name: PRoW 6C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381629	-1.300662	110.30	2.80	113.10
2	53.380669	-1.298871	101.50	2.70	104.20
3	53.379761	-1.298506	101.50	2.80	104.30
4	53.377764	-1.297197	91.60	2.80	94.40
5	53.377693	-1.295212	104.90	2.70	107.60
6	53.377130	-1.294289	110.10	2.70	112.80
7	53.376609	-1.293840	111.90	2.80	114.70
8	53.376404	-1.292327	111.20	2.70	113.90
9	53.375368	-1.291759	116.60	2.70	119.30
10	53.374132	-1.290975	121.60	2.80	124.40
11	53.373499	-1.289645	121.90	2.80	124.70
12	53.372282	-1.291877	120.50	2.70	123.20
13	53.370964	-1.293936	113.50	2.70	116.20
14	53.370695	-1.294473	112.20	2.70	114.90
15	53.369107	-1.295846	106.50	2.70	109.20
16	53.367315	-1.296640	90.30	2.80	93.10

Name: PRoW 7C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.373492	-1.289613	122.00	2.70	124.70
2	53.371834	-1.287918	120.50	2.70	123.20
3	53.371273	-1.285253	119.10	2.80	121.90
4	53.370543	-1.283032	114.20	2.70	116.90
5	53.369128	-1.283601	115.40	2.80	118.20
6	53.368232	-1.286734	106.30	2.80	109.10
7	53.367688	-1.289952	104.60	2.70	107.30
8	53.367118	-1.290435	102.80	2.80	105.60
9	53.367304	-1.292162	104.20	2.70	106.90
10	53.367067	-1.292323	104.60	2.70	107.30
11	53.366465	-1.294276	100.80	2.70	103.50
12	53.365947	-1.296036	89.90	2.70	92.60

Name: PRoW 9C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.388807	-1.276975	107.70	2.80	110.50
2	53.390266	-1.275377	116.90	2.70	119.60
3	53.391354	-1.274583	115.20	2.80	118.00
4	53.392089	-1.276010	100.60	2.80	103.40
5	53.392409	-1.275977	97.20	2.70	99.90
6	53.393926	-1.277544	83.40	2.70	86.10
7	53.393894	-1.278402	81.90	2.70	84.60
8	53.394149	-1.279089	80.60	2.70	83.30
9	53.394744	-1.279743	83.90	2.80	86.70
10	53.395248	-1.279748	84.20	2.80	87.00
11	53.395411	-1.282773	93.50	2.80	96.30
12	53.396345	-1.283514	98.00	2.70	100.70
13	53.397094	-1.283964	99.50	2.80	102.30
14	53.397254	-1.284919	97.80	2.80	100.60

Name: Route 1C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.398156	-1.308463	88.30	1.50	89.80
2	53.398028	-1.305395	91.70	1.50	93.20
3	53.397888	-1.302391	93.90	1.50	95.40
4	53.397734	-1.299387	96.00	1.50	97.50
5	53.397517	-1.296340	96.40	1.50	97.90
6	53.397024	-1.293336	94.40	1.50	95.90
7	53.396276	-1.290589	90.00	1.50	91.50
8	53.395316	-1.288036	85.20	1.50	86.70
9	53.394132	-1.285707	84.50	1.50	86.00
10	53.392757	-1.283714	86.30	1.50	87.80
11	53.391240	-1.282083	94.10	1.50	95.60
12	53.389619	-1.280799	102.10	1.50	103.60
13	53.387904	-1.279876	107.40	1.50	108.90
14	53.386145	-1.279071	110.40	1.50	111.90
15	53.384398	-1.278395	111.80	1.50	113.30
16	53.382606	-1.278116	113.40	1.50	114.90
17	53.380813	-1.278347	114.50	1.50	116.00
18	53.379015	-1.278809	112.60	1.50	114.10
19	53.377434	-1.279356	111.40	1.50	112.90
20	53.375667	-1.280107	110.70	1.50	112.20
21	53.373952	-1.281008	108.70	1.50	110.20
22	53.372198	-1.281759	109.90	1.50	111.40
23	53.370451	-1.282403	109.10	1.50	110.60
24	53.368665	-1.282800	107.70	1.50	109.20
25	53.366872	-1.283090	103.50	1.50	105.00
26	53.365080	-1.283251	100.40	1.50	101.90
27	53.363274	-1.283411	97.50	1.50	99.00
28	53.361418	-1.283647	100.20	1.50	101.70
29	53.359586	-1.283969	93.90	1.50	95.40
30	53.357804	-1.284500	93.10	1.50	94.60

Name: Route 1C - Part 2
Path type: One-way (toward increasing index)
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.395790	-1.270344	100.20	1.50	101.70
2	53.395246	-1.273273	93.80	1.50	95.30
3	53.395047	-1.276224	90.60	1.50	92.10
4	53.394862	-1.279206	87.90	1.50	89.40
5	53.394836	-1.282200	89.30	1.50	90.80
6	53.394836	-1.285193	91.10	1.50	92.60
7	53.394990	-1.288187	89.60	1.50	91.10
8	53.395566	-1.291062	93.30	1.50	94.80
9	53.396493	-1.293647	95.40	1.50	96.90
10	53.397280	-1.296340	97.40	1.50	98.90
11	53.397555	-1.298239	96.50	1.50	98.00

Name: Route 2C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.397977	-1.324224	71.50	1.50	73.00
2	53.396154	-1.324320	72.70	1.50	74.20
3	53.394369	-1.324428	62.20	1.50	63.70
4	53.392577	-1.324460	58.70	1.50	60.20
5	53.390824	-1.323913	62.50	1.50	64.00
6	53.389059	-1.323346	56.30	1.50	57.80
7	53.387274	-1.322831	48.50	1.50	50.00
8	53.385526	-1.322413	40.50	1.50	42.00
9	53.383741	-1.322059	47.50	1.50	49.00
10	53.382710	-1.321715	54.80	1.50	56.30
11	53.381194	-1.320160	62.50	1.50	64.00
12	53.380659	-1.319849	64.60	1.50	66.10
13	53.378931	-1.319356	71.70	1.50	73.20
14	53.376857	-1.318959	79.90	1.50	81.40

Name: Route 3C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.386100	-1.322435	43.20	1.50	44.70
2	53.385312	-1.321222	46.30	1.50	47.80
3	53.384340	-1.318412	55.70	1.50	57.20
4	53.384673	-1.316459	54.10	1.50	55.60
5	53.383994	-1.315204	56.40	1.50	57.90
6	53.383303	-1.315837	57.10	1.50	58.60
7	53.382177	-1.315418	57.50	1.50	59.00
8	53.381569	-1.313970	60.40	1.50	61.90
9	53.381479	-1.311567	73.30	1.50	74.80
10	53.381479	-1.308541	93.30	1.50	94.80
11	53.381620	-1.305440	102.80	1.50	104.30

Name: Route 4C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.375023	-1.318160	85.40	1.50	86.90
2	53.374658	-1.315360	93.80	1.50	95.30
3	53.374133	-1.314351	96.80	1.50	98.30
4	53.372507	-1.313536	100.70	1.50	102.20
5	53.371631	-1.313086	101.10	1.50	102.60
6	53.370216	-1.311584	101.50	1.50	103.00
7	53.368955	-1.309588	97.40	1.50	98.90
8	53.367899	-1.307496	98.20	1.50	99.70
9	53.366734	-1.305253	93.90	1.50	95.40
10	53.365460	-1.303096	95.70	1.50	97.20
11	53.364768	-1.302270	99.30	1.50	100.80
12	53.364209	-1.302175	98.20	1.50	99.70
13	53.363292	-1.299655	101.10	1.50	102.60
14	53.362709	-1.298303	102.90	1.50	104.40
15	53.363285	-1.295524	97.00	1.50	98.50
16	53.363465	-1.294409	95.70	1.50	97.20
17	53.362856	-1.292005	98.00	1.50	99.50
18	53.362575	-1.290203	102.00	1.50	103.50
19	53.362555	-1.288518	102.20	1.50	103.70

Name: Route 5C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361239	-1.288554	99.40	1.50	100.90
2	53.362077	-1.286397	100.80	1.50	102.30
3	53.362865	-1.284777	101.70	1.50	103.20
4	53.362756	-1.282427	103.40	1.50	104.90
5	53.362730	-1.280421	103.40	1.50	104.90
6	53.363038	-1.277889	109.50	1.50	111.00
7	53.363089	-1.274070	117.70	1.50	119.20
8	53.362999	-1.272696	119.30	1.50	120.80

Name: Route 6C
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381631	-1.278500	113.30	1.50	114.80
2	53.383417	-1.278747	114.70	1.50	116.20
3	53.384869	-1.278961	114.60	1.50	116.10
4	53.386584	-1.278017	120.40	1.50	121.90
5	53.388197	-1.276644	114.10	1.50	115.60
6	53.389803	-1.275249	115.50	1.50	117.00
7	53.391402	-1.273962	115.60	1.50	117.10
8	53.393008	-1.272664	113.20	1.50	114.70
9	53.394569	-1.271237	108.50	1.50	110.00
10	53.396118	-1.269660	105.30	1.50	106.80

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.396201	-1.285586	96.10	2.00
OP 2	2	53.383382	-1.274777	112.20	2.00
OP 3	3	53.382338	-1.273393	111.90	2.00
OP 4	4	53.380284	-1.265014	110.40	2.00
OP 5	5	53.381975	-1.276719	110.60	2.00
OP 6	6	53.381063	-1.279603	109.40	2.00
OP 7	7	53.372900	-1.269771	112.60	2.00
OP 8	8	53.371815	-1.272362	110.90	2.00
OP 9	9	53.371549	-1.277909	110.70	2.00
OP 10	10	53.366365	-1.278434	119.60	2.00
OP 11	11	53.363861	-1.284726	99.50	2.00
OP 12	12	53.362856	-1.287087	101.70	2.00
OP 13	13	53.363914	-1.293270	92.50	2.00
OP 14	14	53.367221	-1.305635	97.10	2.00
OP 15	15	53.367916	-1.307024	100.20	2.00
OP 16	16	53.369009	-1.310120	99.60	2.00
OP 17	17	53.370860	-1.312596	103.90	2.00
OP 18	18	53.374243	-1.314985	97.70	2.00
OP 19	19	53.375129	-1.316777	92.80	2.00
OP 20	20	53.375715	-1.317255	88.30	2.00
OP 21	21	53.376659	-1.318413	78.10	2.00
OP 22	22	53.378540	-1.302605	104.80	2.00
OP 23	23	53.380072	-1.302100	108.20	2.00
OP 24	24	53.381583	-1.301328	112.60	2.00
OP 25	25	53.382543	-1.300448	107.50	2.00
OP 26	26	53.382997	-1.300657	107.00	2.00
OP 27	27	53.383455	-1.297516	103.10	2.00
OP 28	28	53.382571	-1.301419	110.10	2.00
OP 29	29	53.383085	-1.302741	111.40	2.00
OP 30	30	53.383037	-1.304045	113.10	2.00
OP 31	31	53.382317	-1.310813	84.30	2.00
OP 32	32	53.387979	-1.321788	61.10	2.00
OP 33	33	53.393621	-1.325844	56.10	2.00
OP 34	34	53.395264	-1.312093	103.40	2.00
OP 35	35	53.395741	-1.323204	75.80	2.00
OP 36	36	53.397398	-1.321887	78.70	2.00
OP 37	37	53.396755	-1.312789	92.20	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	248,851	4,147.5	96,748	1,612.5	-
PV array 2	25.0	180.0	209,025	3,483.8	117,546	1,959.1	-
PV array 3	25.0	180.0	20,629	343.8	36,790	613.2	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1C	93,404	1,556.7	31,019	517.0
PRoW 2C	132,918	2,215.3	41,630	693.8
PRoW 3C	2,266	37.8	7,374	122.9
PRoW 4C	7	0.1	55	0.9
PRoW 5C	3,896	64.9	4,960	82.7
PRoW 6C	48,267	804.5	23,672	394.5
PRoW 7C	137,878	2,298.0	50,564	842.7
PRoW 9C	2,876	47.9	1,128	18.8
Route 1C	3,818	63.6	5,250	87.5
Route 1C - Part 2	4,537	75.6	5,246	87.4
Route 2C	0	0.0	0	0.0
Route 3C	830	13.8	4,519	75.3
Route 4C	2,029	33.8	5,663	94.4
Route 5C	0	0.0	0	0.0
Route 6C	59	1.0	1	0.0
OP 1	411	6.8	497	8.3
OP 2	1,561	26.0	3,089	51.5
OP 3	2,015	33.6	1,795	29.9
OP 4	1,813	30.2	1,787	29.8
OP 5	2,082	34.7	1,482	24.7
OP 6	441	7.3	2,395	39.9
OP 7	2,505	41.8	1,409	23.5
OP 8	2,695	44.9	1,648	27.5
OP 9	977	16.3	3,103	51.7
OP 10	132	2.2	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	1,172	19.5	0	0.0
OP 15	1,319	22.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 16	1,530	25.5	0	0.0
OP 17	3,139	52.3	428	7.1
OP 18	2,614	43.6	4,467	74.5
OP 19	2,757	46.0	3,224	53.7
OP 20	2,349	39.1	1,605	26.8
OP 21	1,366	22.8	1,704	28.4
OP 22	4,265	71.1	10,161	169.3
OP 23	613	10.2	2,681	44.7
OP 24	772	12.9	3,414	56.9
OP 25	652	10.9	2,903	48.4
OP 26	568	9.5	2,678	44.6
OP 27	727	12.1	3,063	51.0
OP 28	656	10.9	2,882	48.0
OP 29	591	9.8	2,664	44.4
OP 30	585	9.8	2,632	43.9
OP 31	564	9.4	1,032	17.2
OP 32	468	7.8	1,569	26.1
OP 33	1,647	27.4	702	11.7
OP 34	857	14.3	3,698	61.6
OP 35	711	11.8	183	3.0
OP 36	132	2.2	0	0.0
OP 37	1,034	17.2	1,108	18.5

PV: PV array 1 potential temporary after-image

Receptor results ordered by category of glare

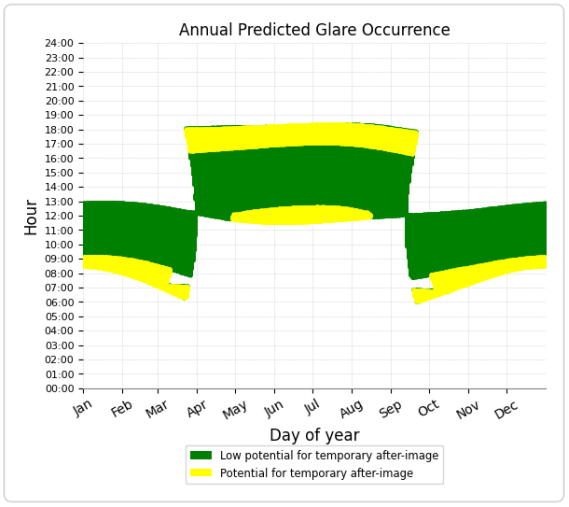
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1C	93,404	1,556.7	31,019	517.0
PRoW 2C	132,247	2,204.1	41,039	684.0
PRoW 3C	1,858	31.0	6,504	108.4
PRoW 9C	2,876	47.9	1,128	18.8
Route 1C	2,946	49.1	1,771	29.5
Route 1C - Part 2	4,537	75.6	5,246	87.4
Route 3C	308	5.1	219	3.6
PRoW 4C	0	0.0	0	0.0
PRoW 5C	0	0.0	0	0.0
PRoW 6C	0	0.0	0	0.0
PRoW 7C	0	0.0	0	0.0
Route 2C	0	0.0	0	0.0
Route 4C	0	0.0	0	0.0
Route 5C	0	0.0	0	0.0
Route 6C	0	0.0	0	0.0
OP 1	411	6.8	497	8.3
OP 2	1,226	20.4	1,094	18.2
OP 3	1,361	22.7	618	10.3
OP 4	1,428	23.8	353	5.9
OP 32	408	6.8	1,569	26.1
OP 33	1,647	27.4	702	11.7
OP 34	857	14.3	3,698	61.6
OP 35	711	11.8	183	3.0
OP 37	1,034	17.2	1,108	18.5
OP 5	1,460	24.3	0	0.0
OP 36	132	2.2	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0

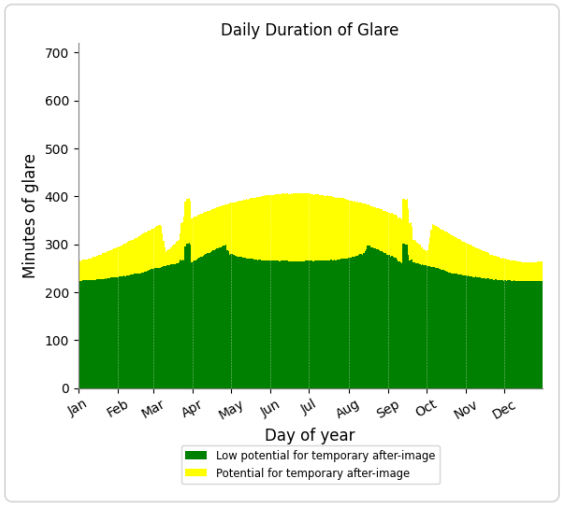
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0

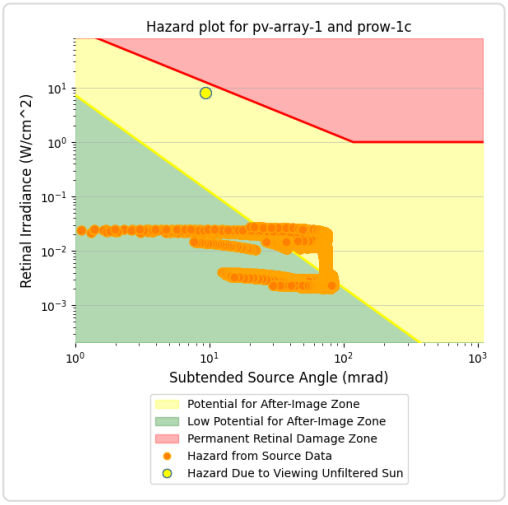
PV array 1 and Route: PRoW 1C

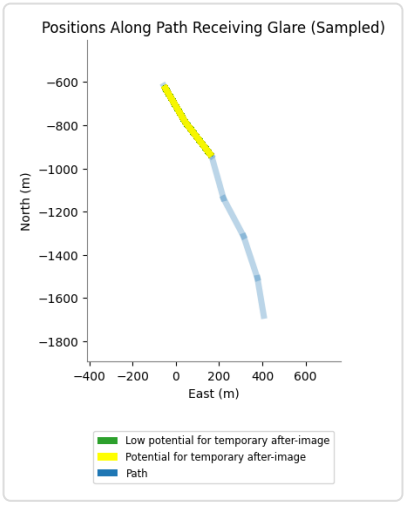
Yellow glare: 31,019 min.

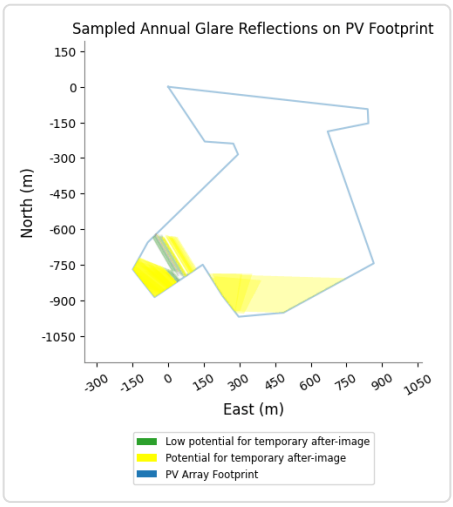
Green glare: 93,404 min.







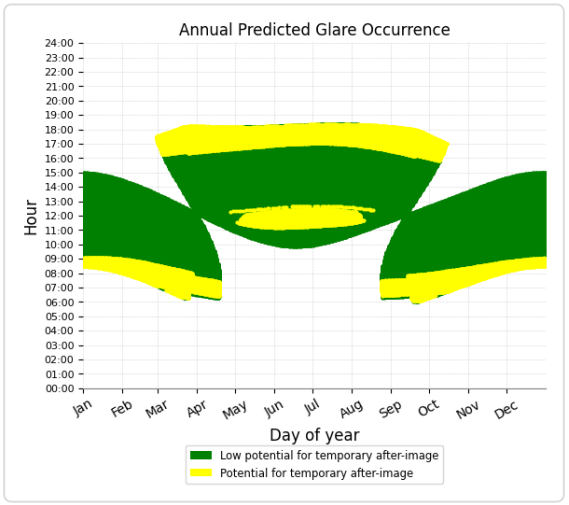


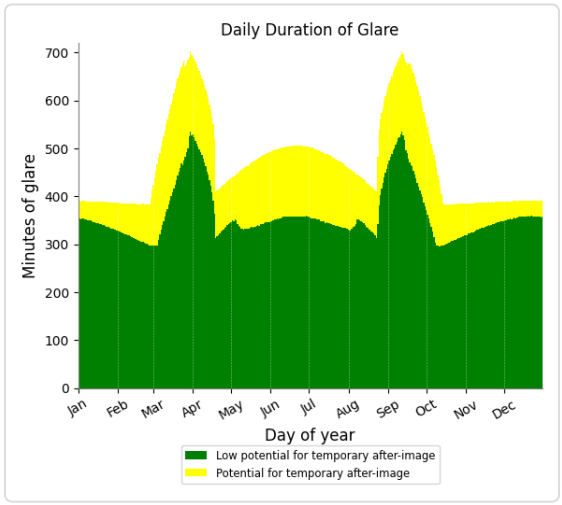


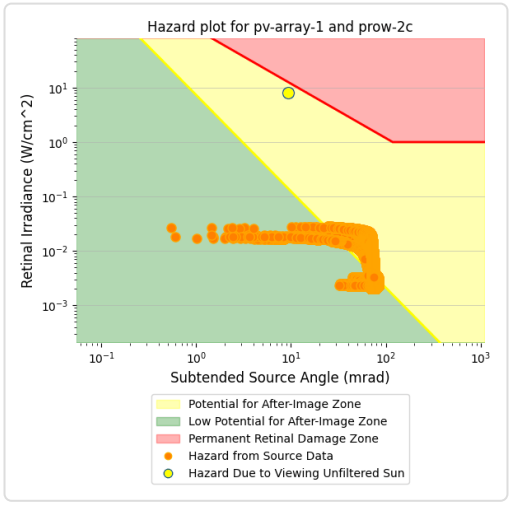
PV array 1 and Route: PRoW 2C

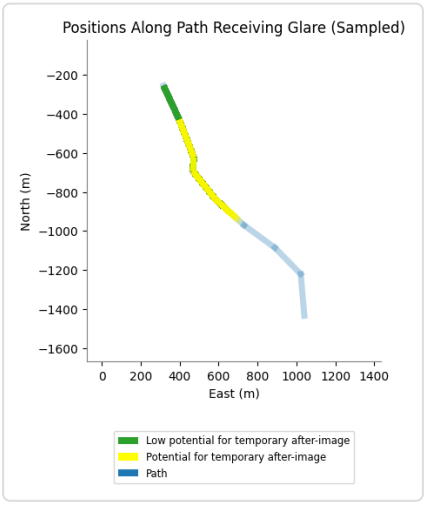
Yellow glare: 41,039 min.

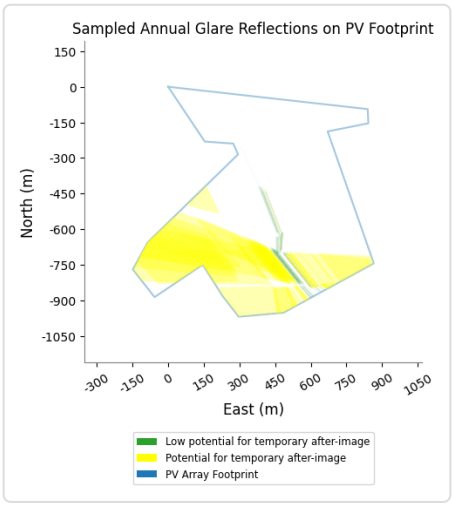
Green glare: 132,247 min.







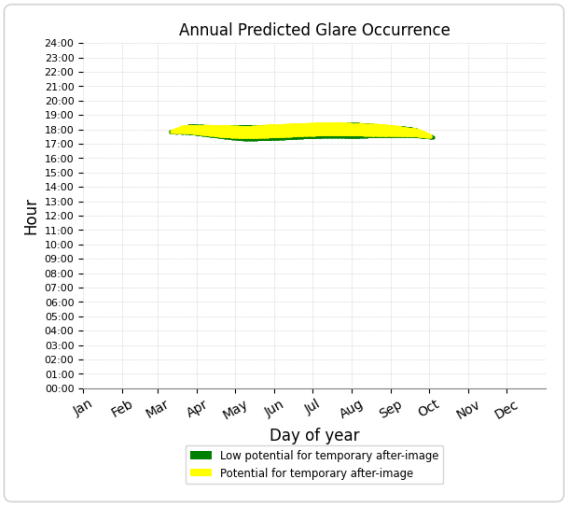


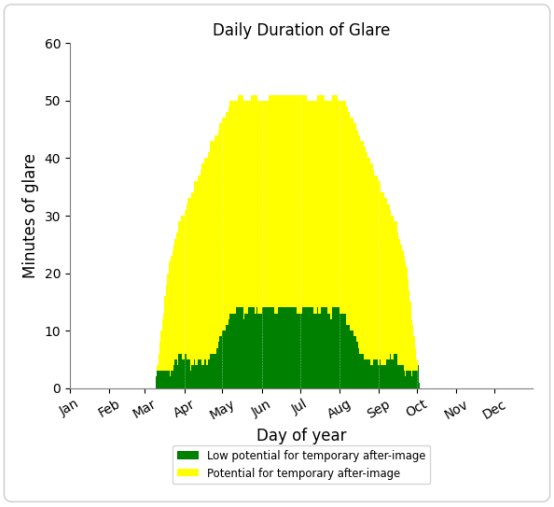


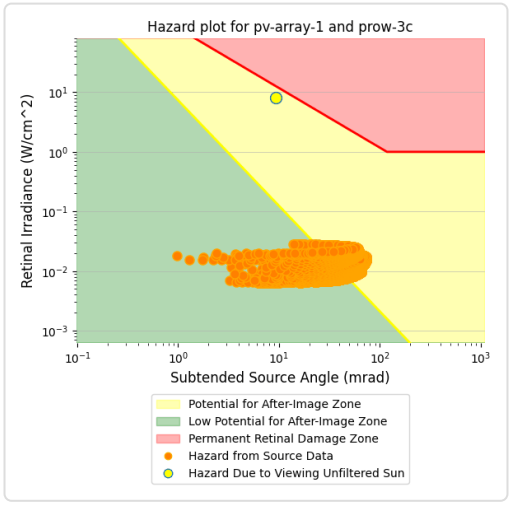
PV array 1 and Route: PRoW 3C

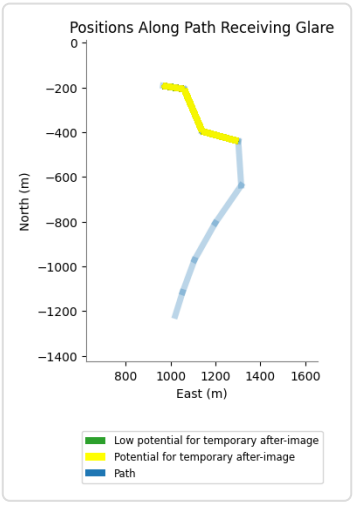
Yellow glare: 6,504 min.

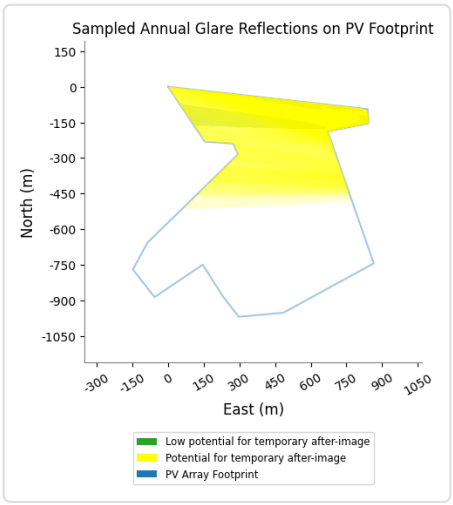
Green glare: 1,858 min.







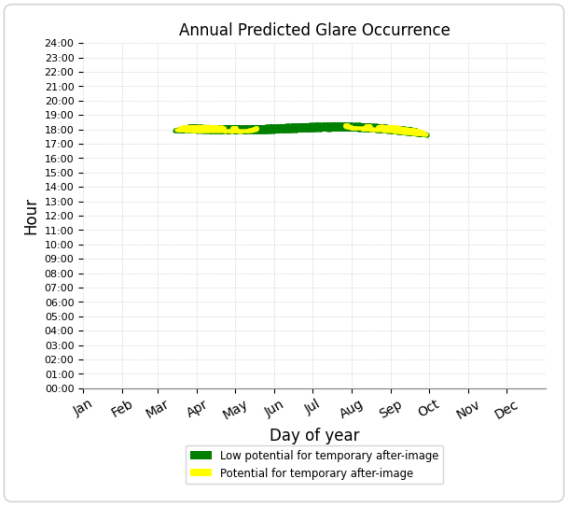


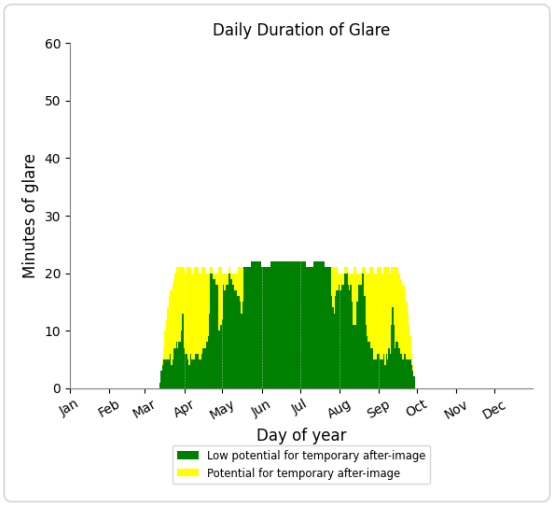


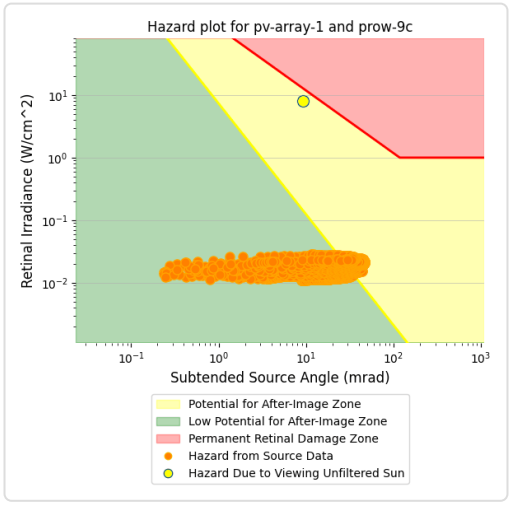
PV array 1 and Route: PRoW 9C

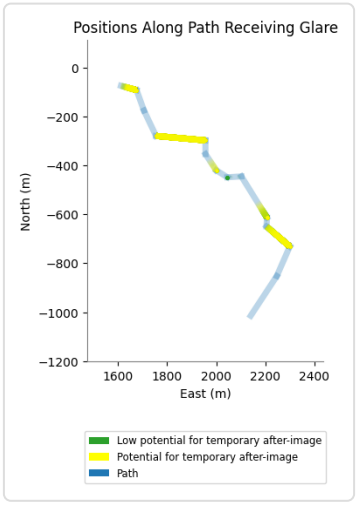
Yellow glare: 1,128 min.

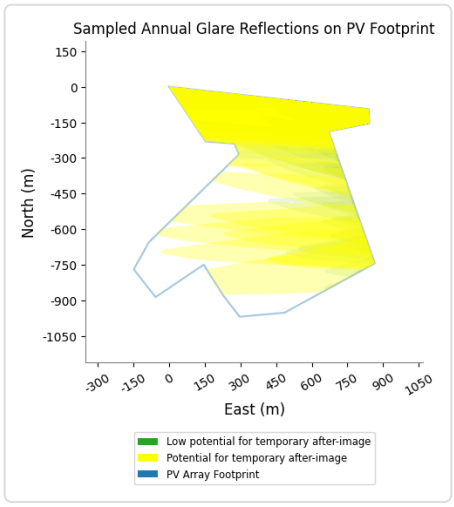
Green glare: 2,876 min.







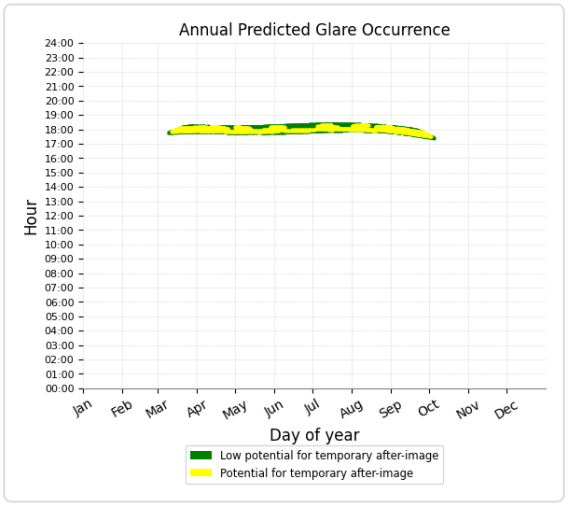


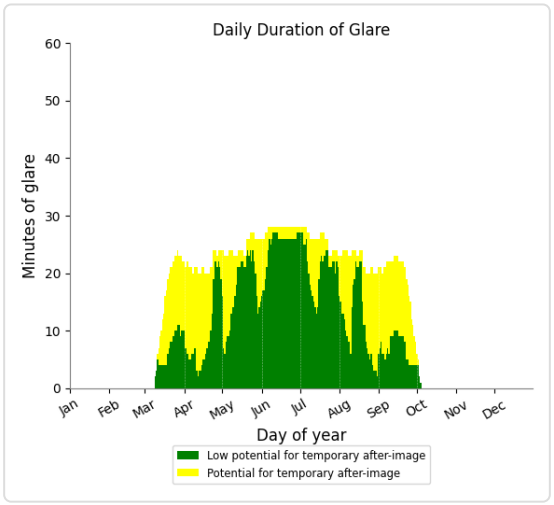


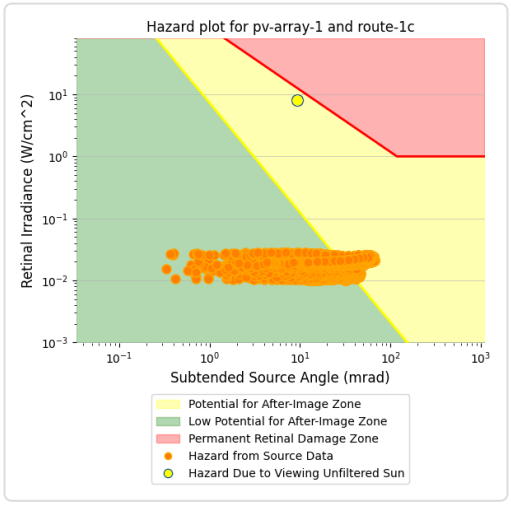
PV array 1 and Route: Route 1C

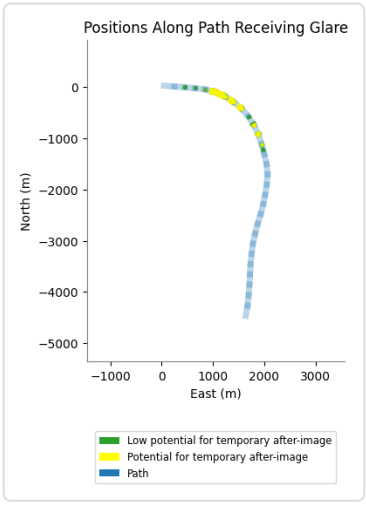
Yellow glare: 1,771 min.

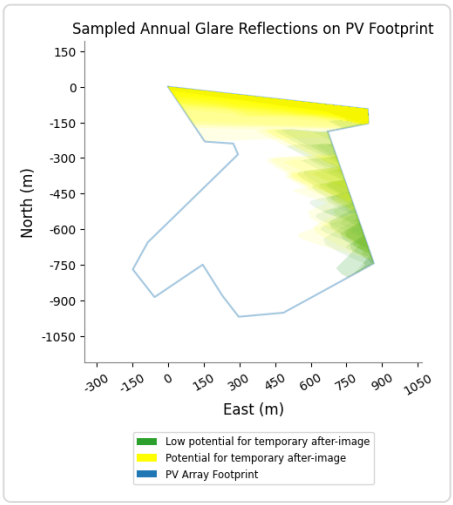
Green glare: 2,946 min.







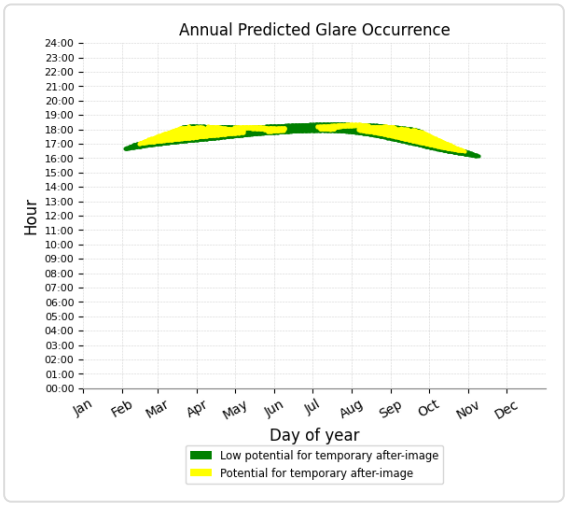


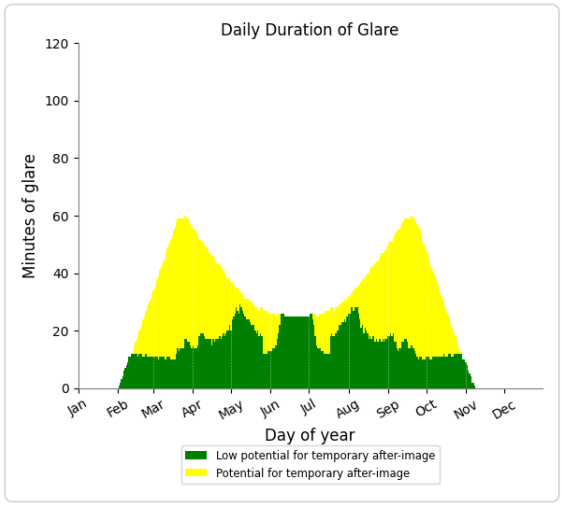


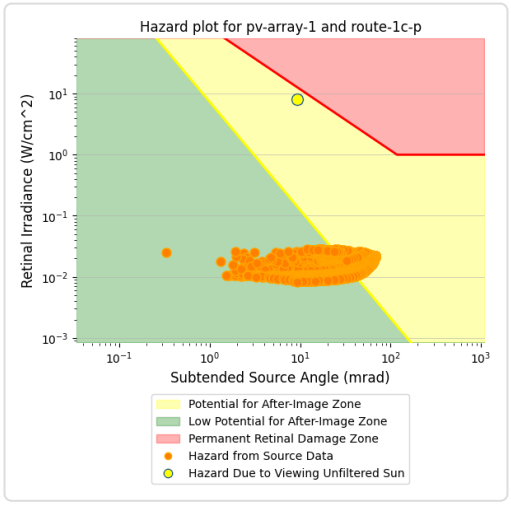
PV array 1 and Route: Route 1C - Part 2

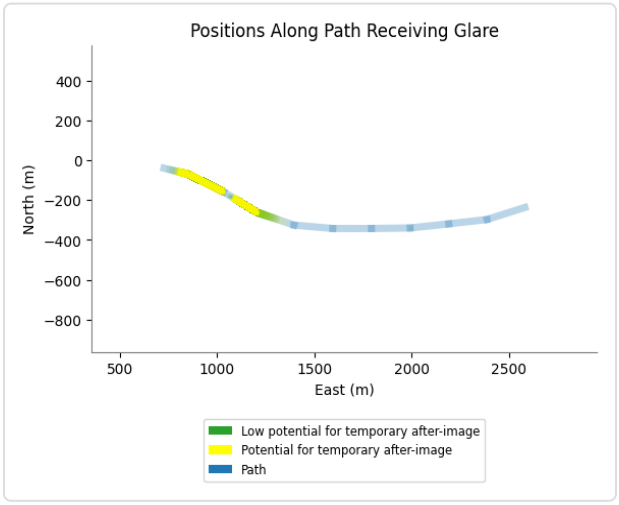
Yellow glare: 5,246 min.

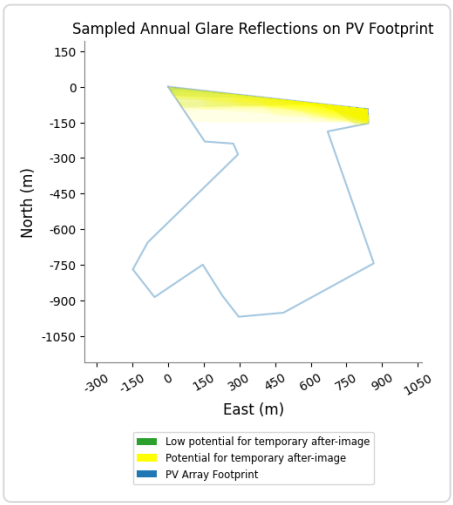
Green glare: 4,537 min.







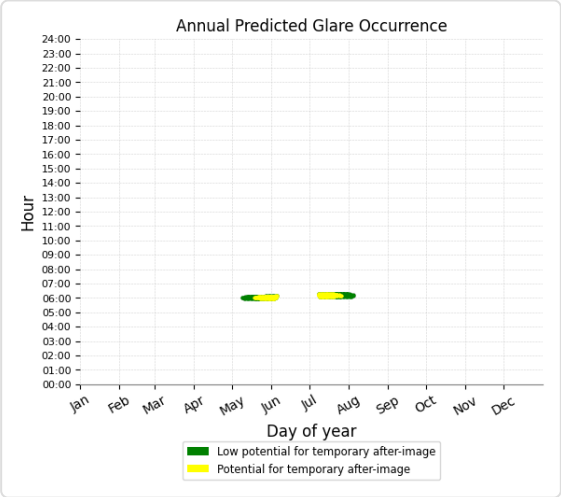


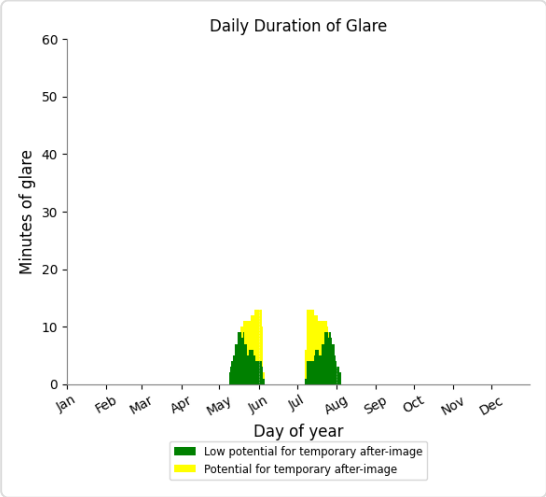


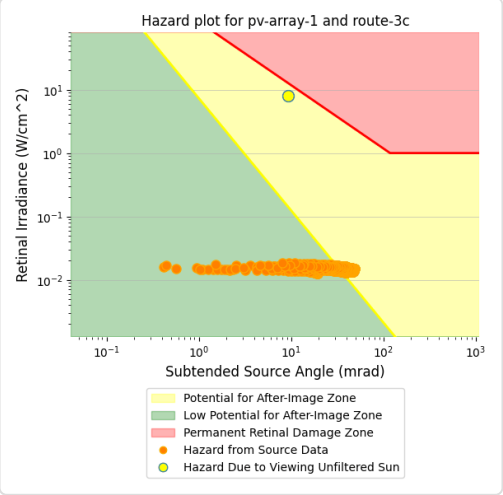
PV array 1 and Route: Route 3C

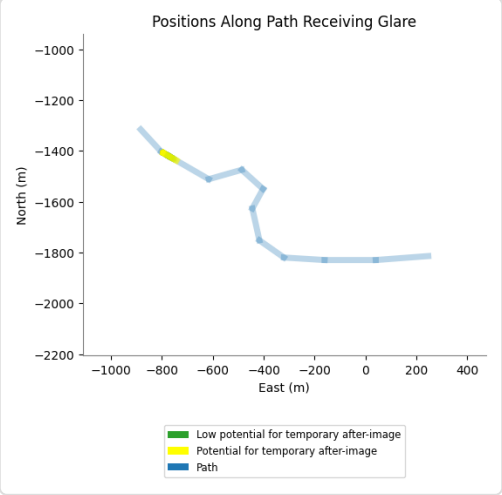
Yellow glare: 219 min.

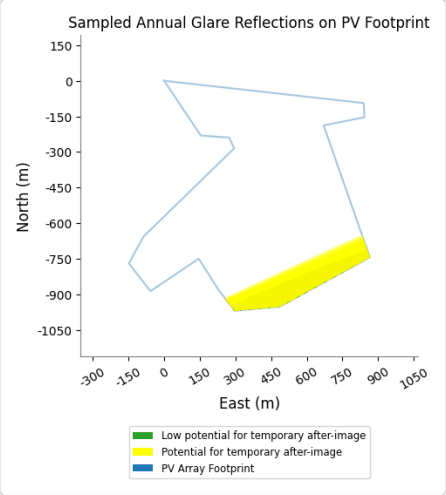
Green glare: 308 min.











PV array 1 and Route: PRoW 4C

No glare found

PV array 1 and Route: PRoW 5C

No glare found

PV array 1 and Route: PRoW 6C

No glare found

PV array 1 and Route: PRoW 7C

No glare found

PV array 1 and Route: Route 2C

No glare found

PV array 1 and Route: Route 4C

No glare found

PV array 1 and Route: Route 5C

No glare found

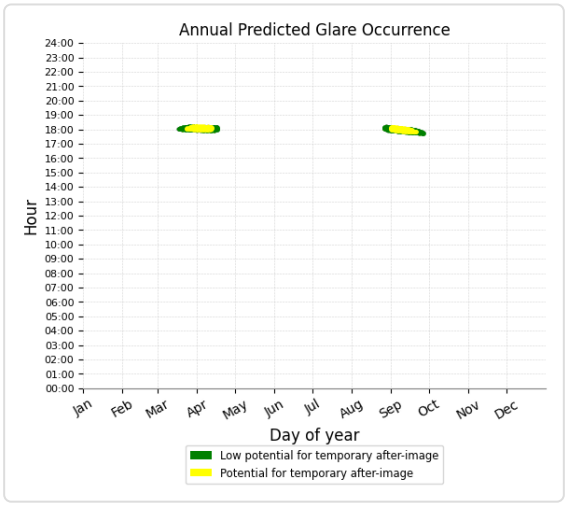
PV array 1 and Route: Route 6C

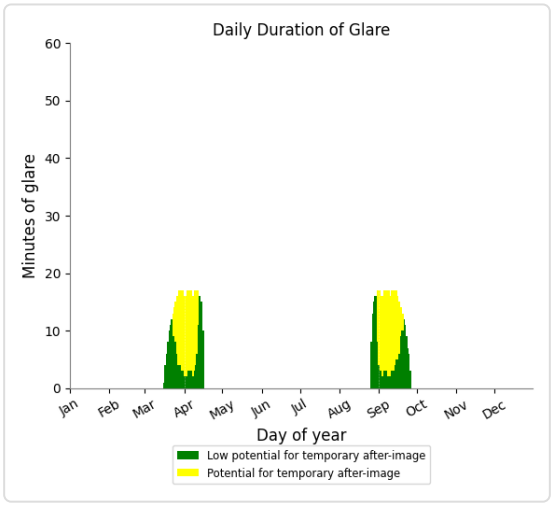
No glare found

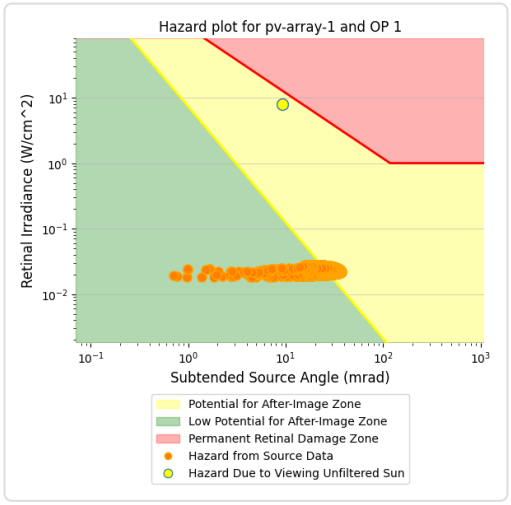
PV array 1 and OP 1

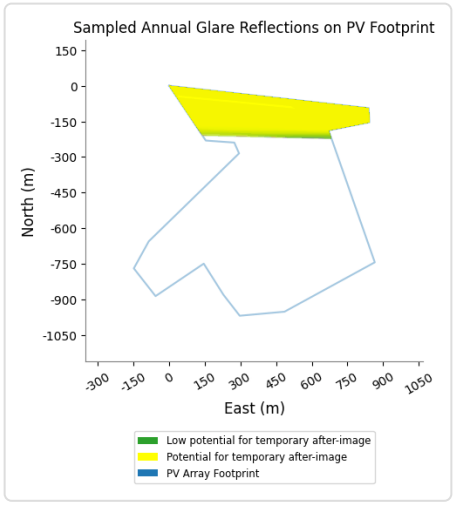
Yellow glare: 497 min.

Green glare: 411 min.





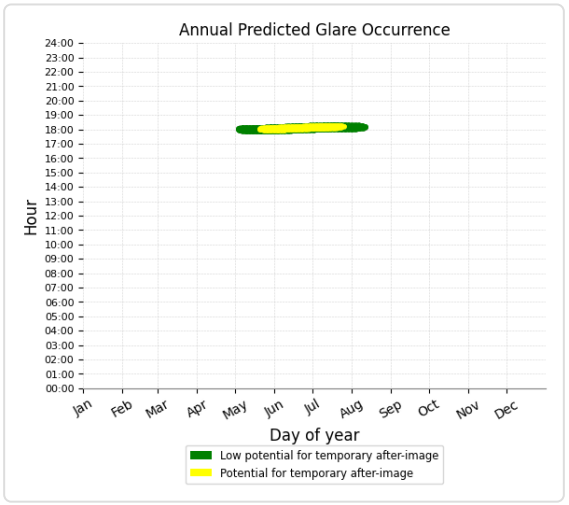


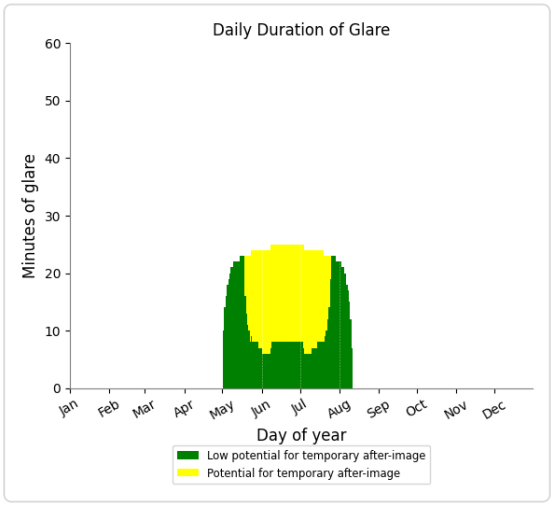


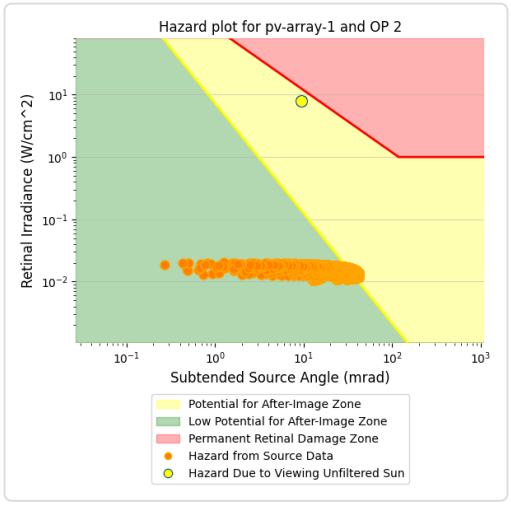
PV array 1 and OP 2

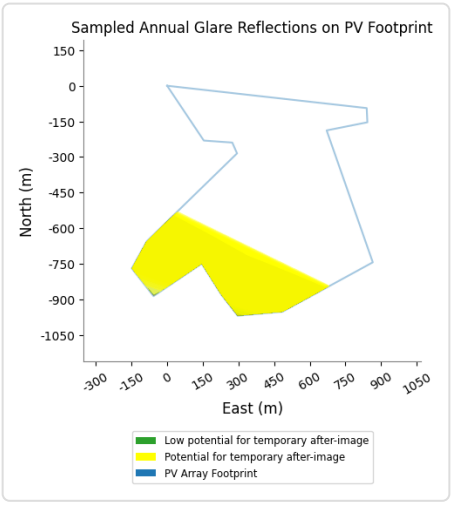
Yellow glare: 1,094 min.

Green glare: 1,226 min.





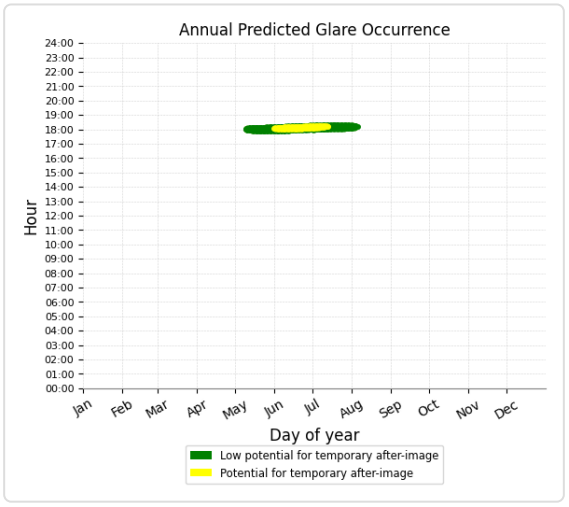


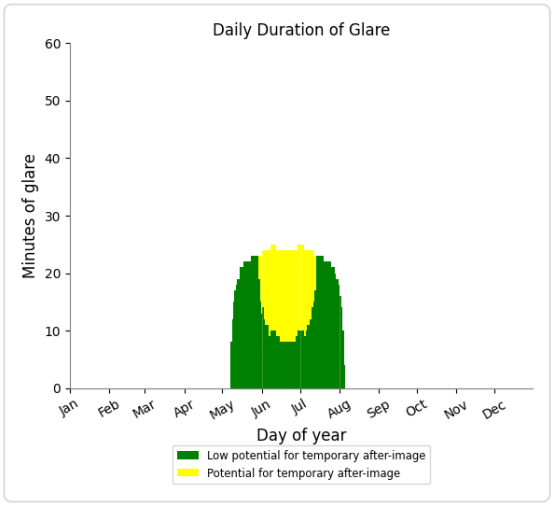


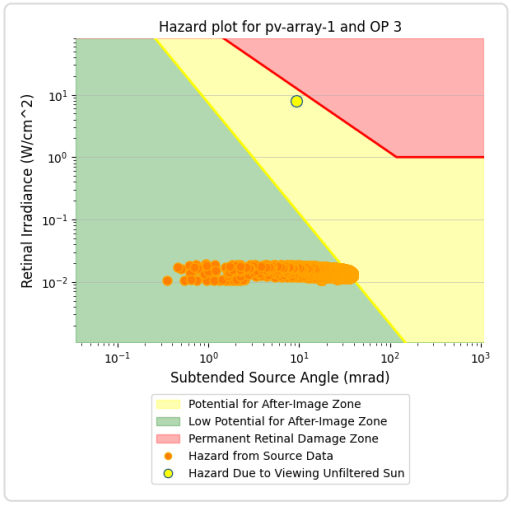
PV array 1 and OP 3

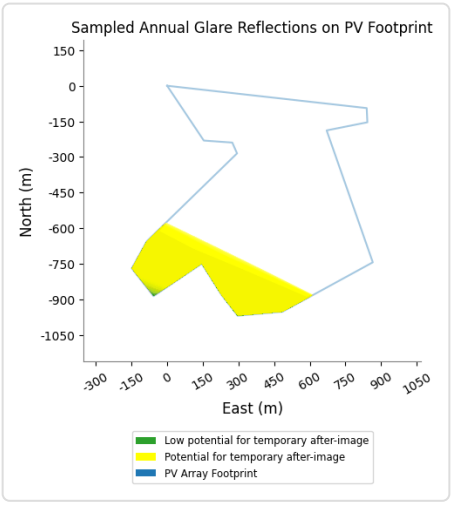
Yellow glare: 618 min.

Green glare: 1,361 min.





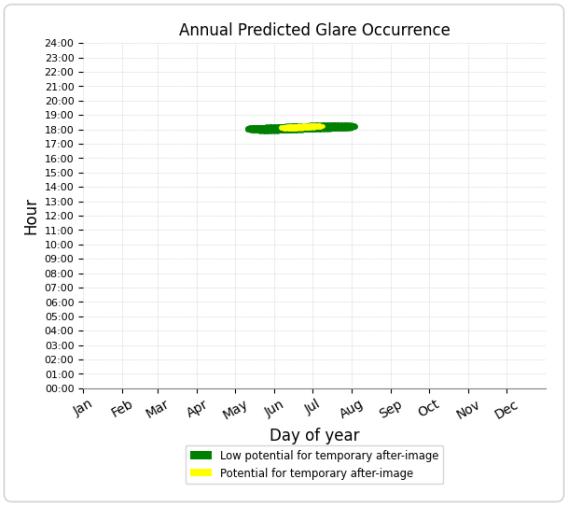


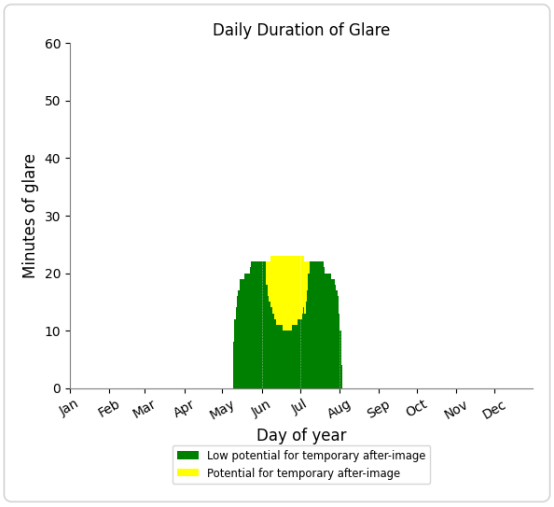


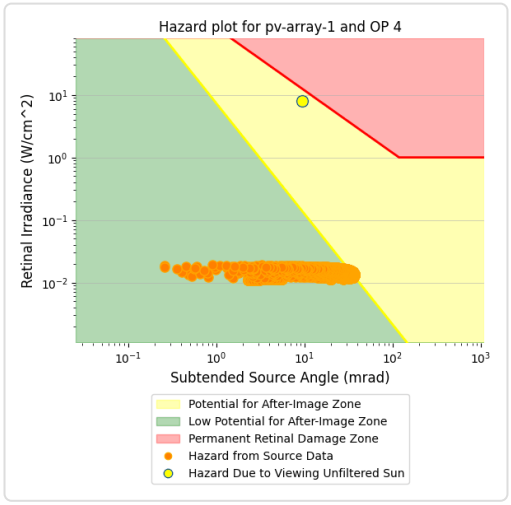
PV array 1 and OP 4

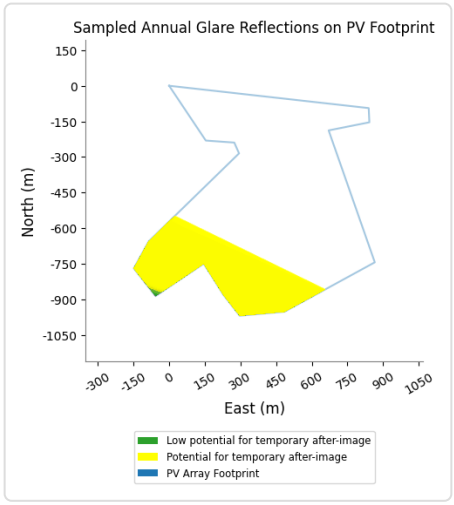
Yellow glare: 353 min.

Green glare: 1,428 min.





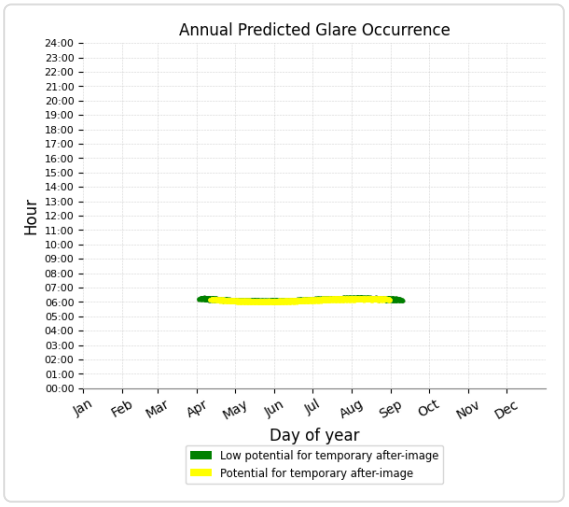


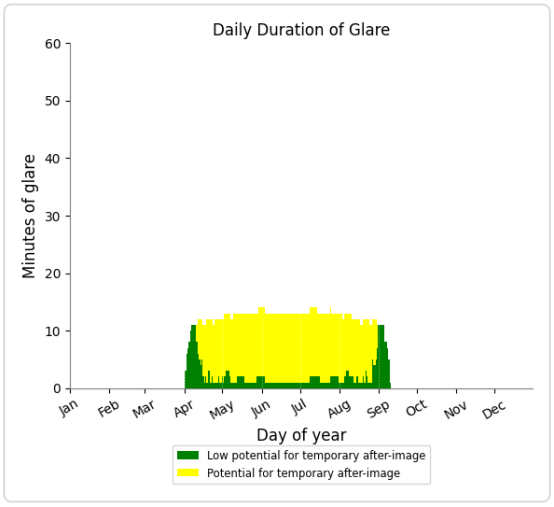


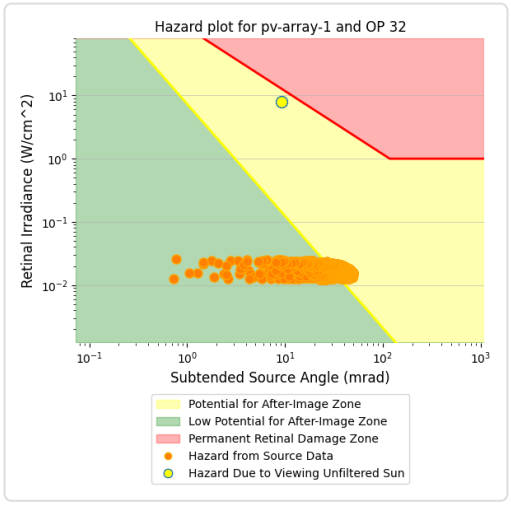
PV array 1 and OP 32

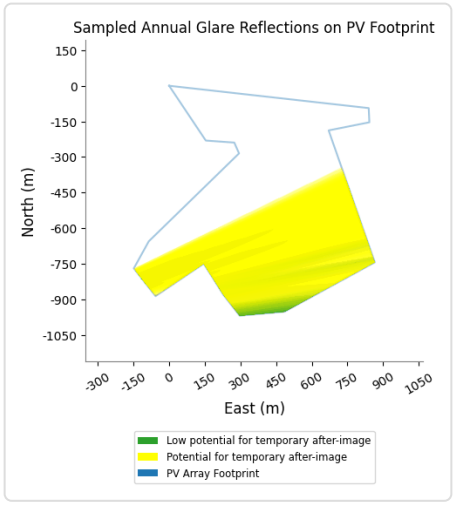
Yellow glare: 1,569 min.

Green glare: 408 min.





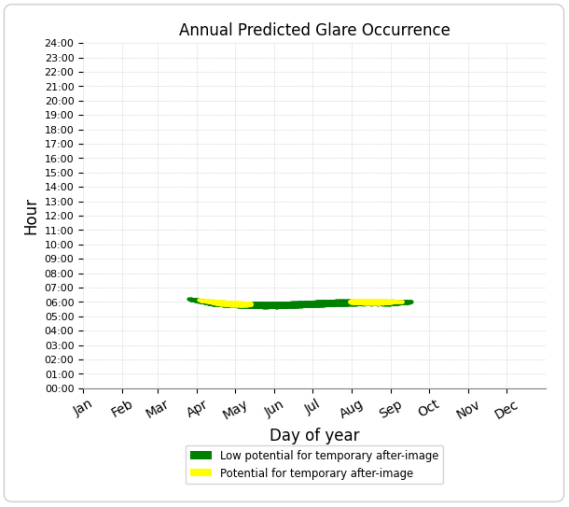


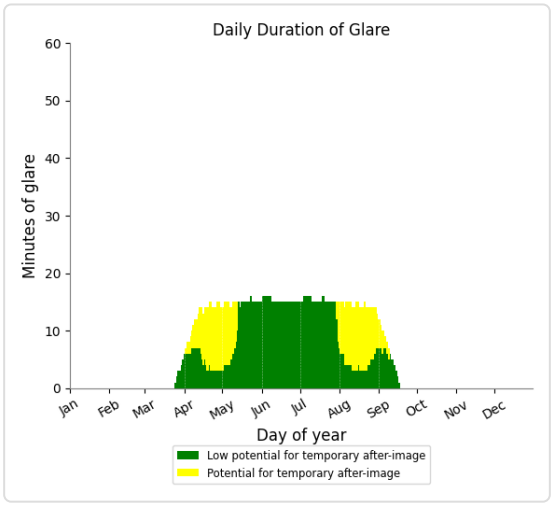


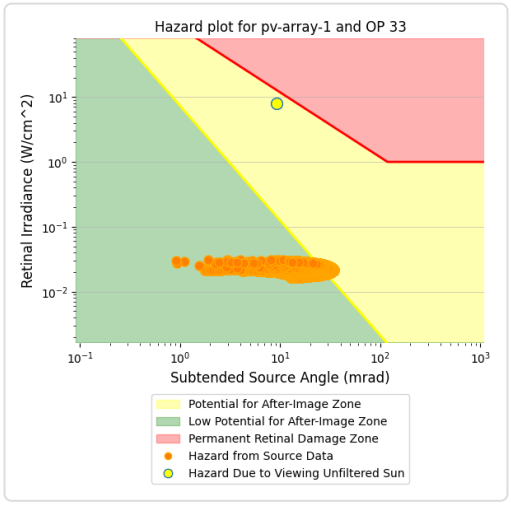
PV array 1 and OP 33

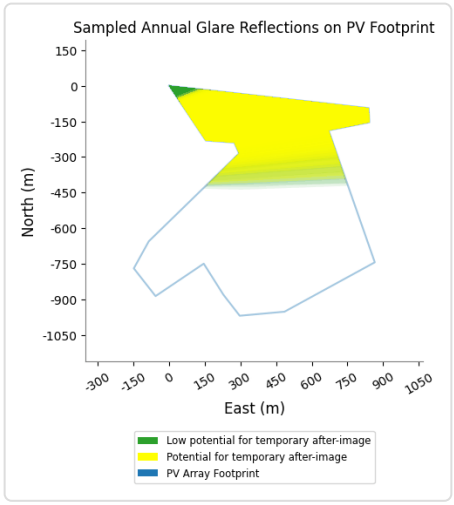
Yellow glare: 702 min.

Green glare: 1,647 min.





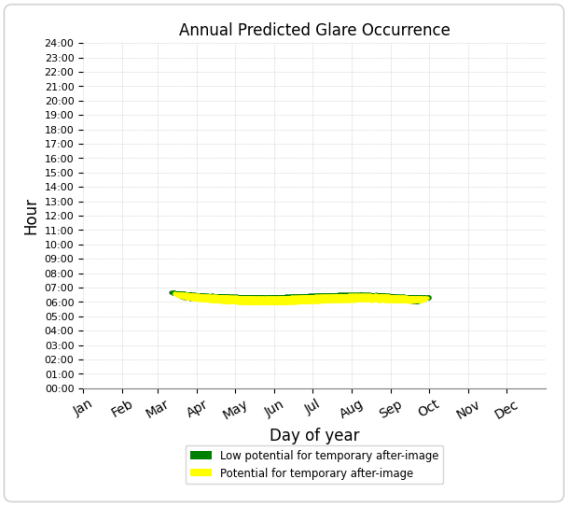


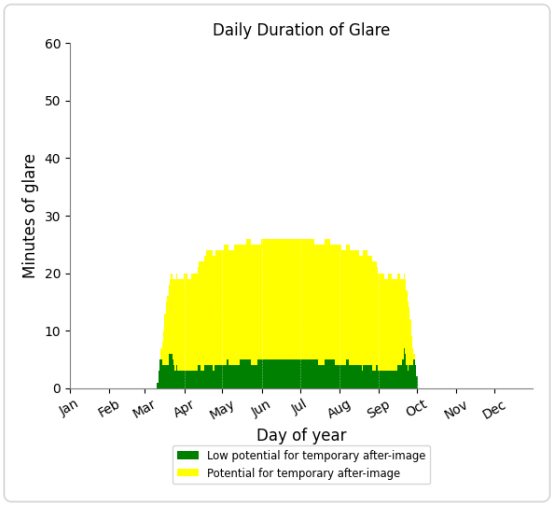


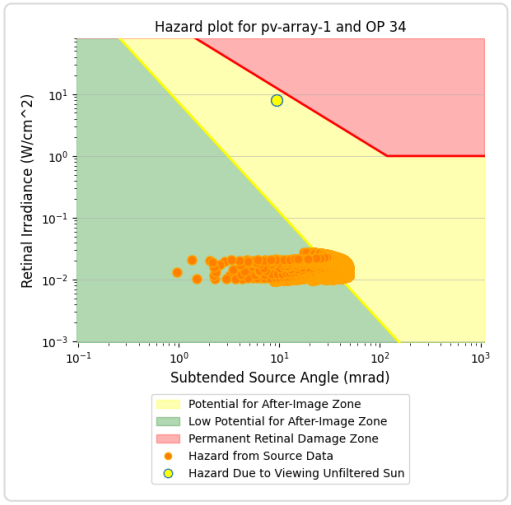
PV array 1 and OP 34

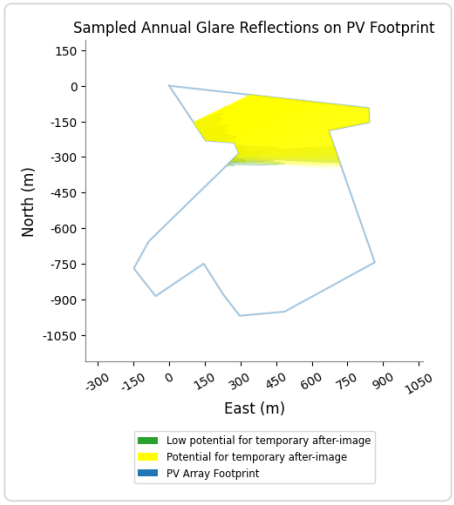
Yellow glare: 3,698 min.

Green glare: 857 min.





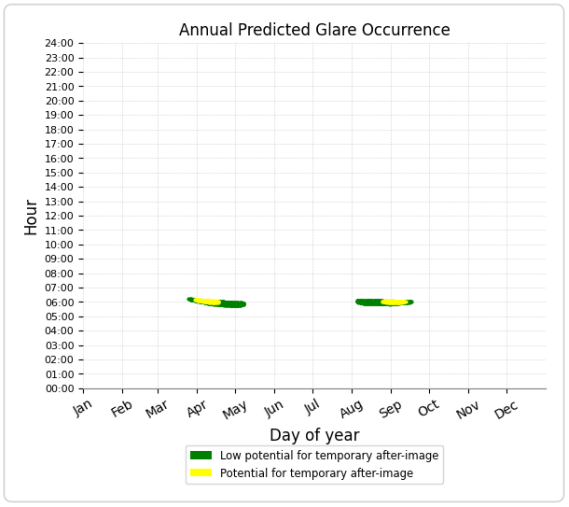


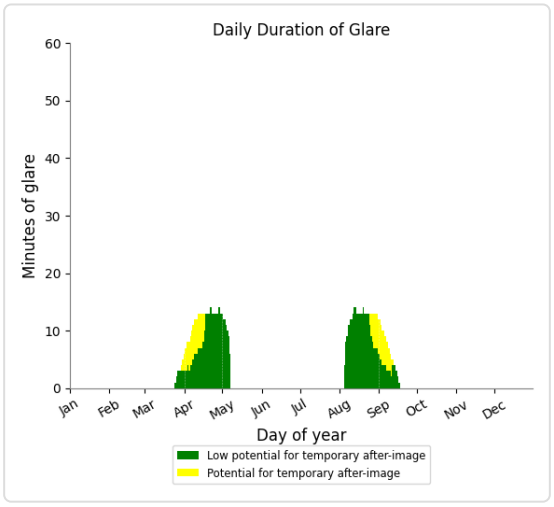


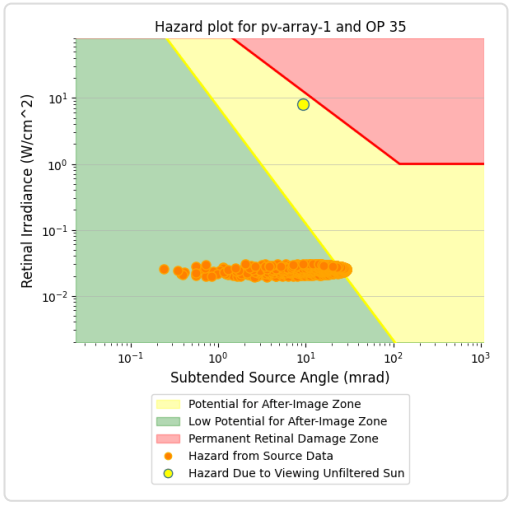
PV array 1 and OP 35

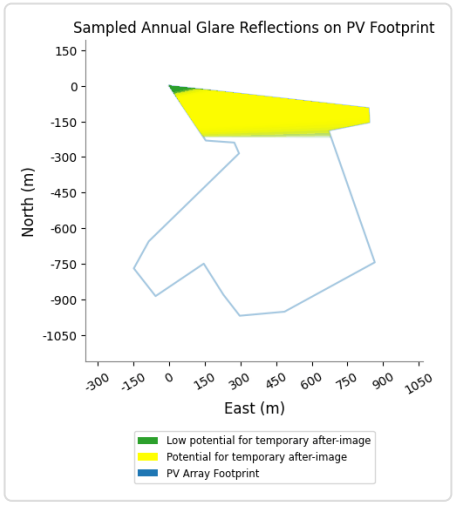
Yellow glare: 183 min.

Green glare: 711 min.





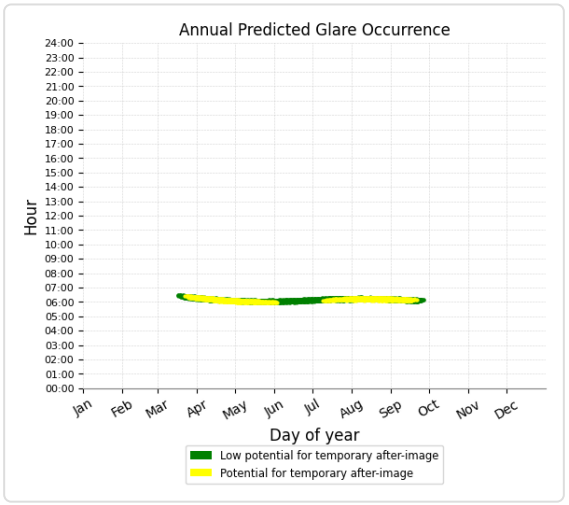


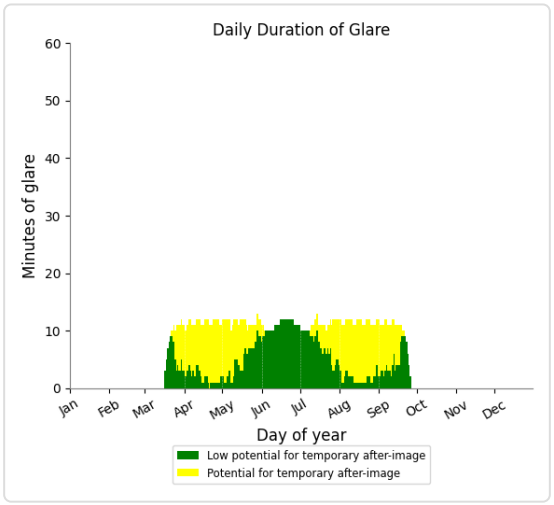


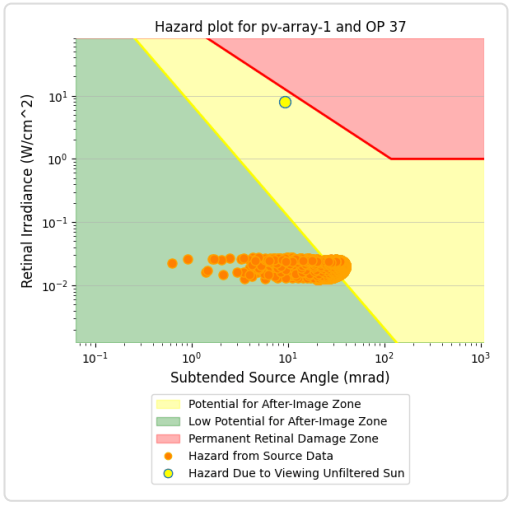
PV array 1 and OP 37

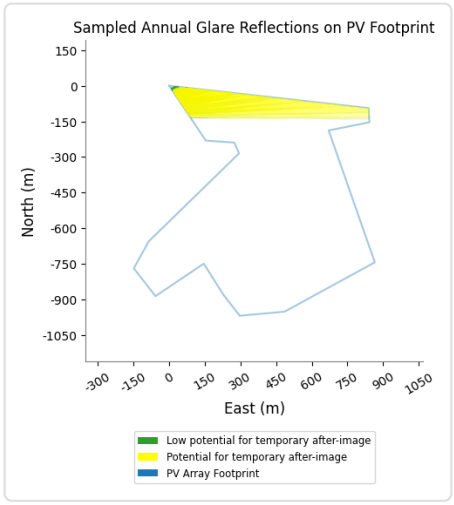
Yellow glare: 1,108 min.

Green glare: 1,034 min.





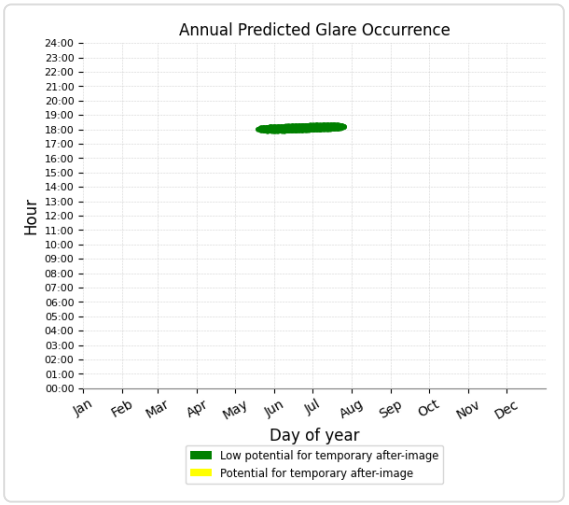


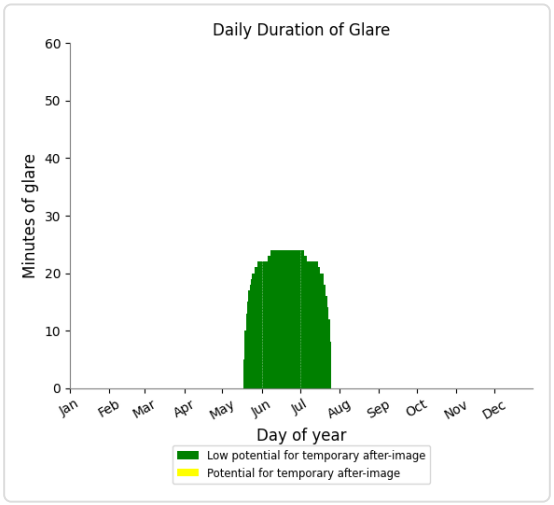


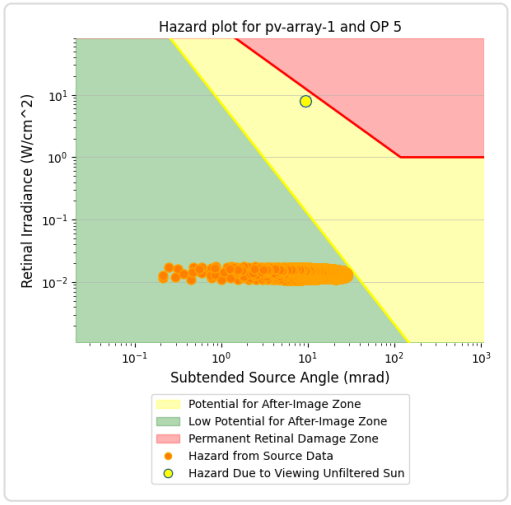
PV array 1 and OP 5

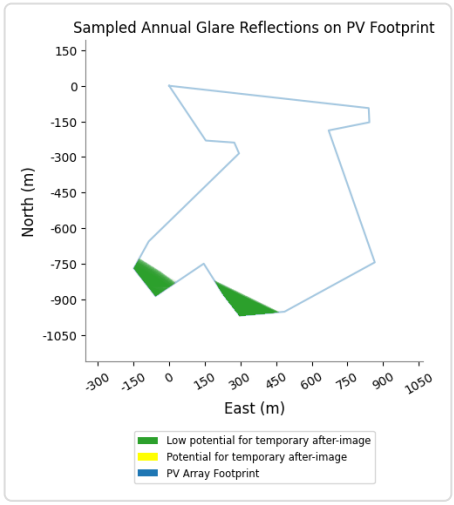
Yellow glare: none

Green glare: 1,460 min.



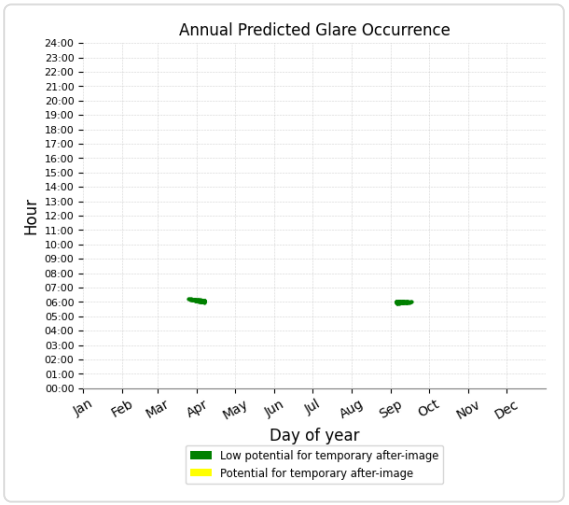


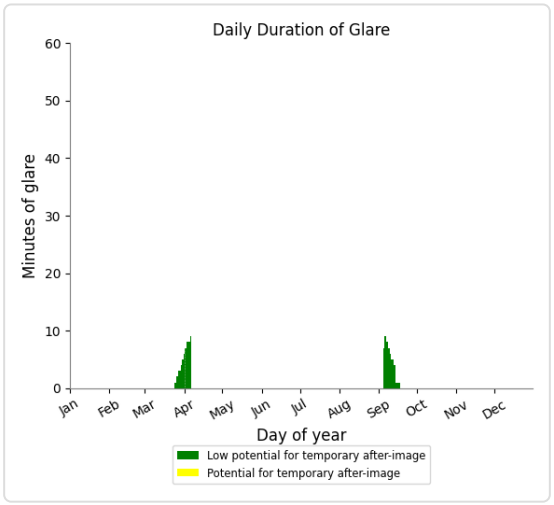


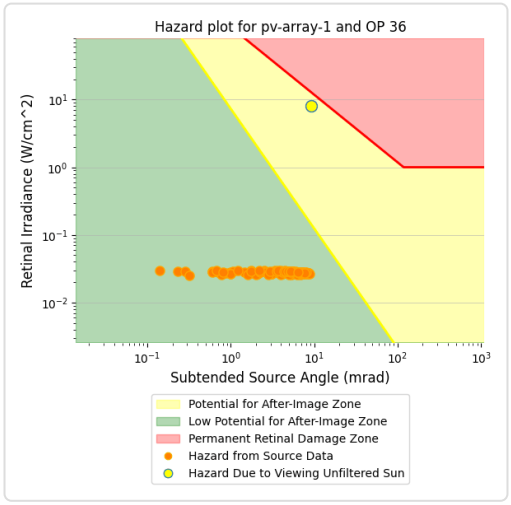


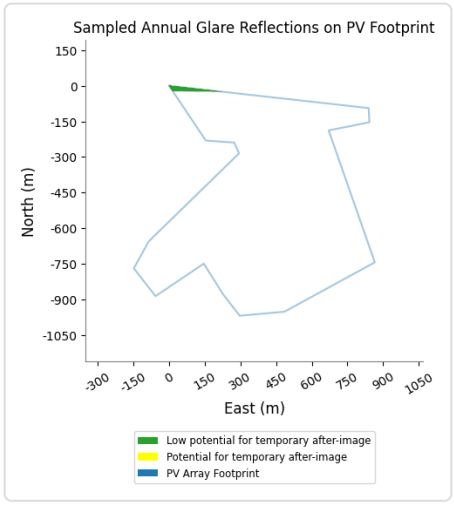
PV array 1 and OP 36

Yellow glare: none
Green glare: 132 min.









PV array 1 and OP 6

No glare found

PV array 1 and OP 7

No glare found

PV array 1 and OP 8

No glare found

PV array 1 and OP 9

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 11

No glare found

PV array 1 and OP 12

No glare found

PV array 1 and OP 13

No glare found

PV array 1 and OP 14

No glare found

PV array 1 and OP 15

No glare found

PV array 1 and OP 16

No glare found

PV array 1 and OP 17

No glare found

PV array 1 and OP 18

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 22

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV array 1 and OP 26

No glare found

PV array 1 and OP 27

No glare found

PV array 1 and OP 28

No glare found

PV array 1 and OP 29

No glare found

PV array 1 and OP 30

No glare found

PV array 1 and OP 31

No glare found

PV: PV array 2 potential temporary after-image

Receptor results ordered by category of glare

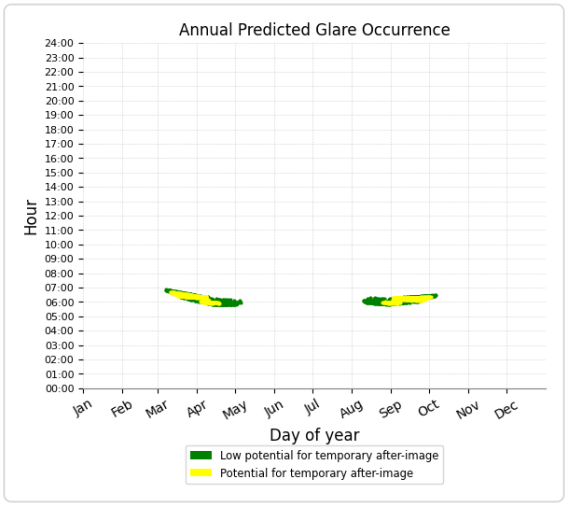
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2C	671	11.2	591	9.8
PRoW 3C	408	6.8	870	14.5
PRoW 4C	7	0.1	55	0.9
PRoW 5C	1,220	20.3	2,563	42.7
PRoW 6C	47,443	790.7	14,879	248.0
PRoW 7C	137,687	2,294.8	48,454	807.6
Route 1C	872	14.5	3,479	58.0
Route 3C	522	8.7	4,300	71.7
Route 4C	1,305	21.8	1,312	21.9
Route 6C	59	1.0	1	0.0
PRoW 1C	0	0.0	0	0.0
PRoW 9C	0	0.0	0	0.0
Route 1C - Part 2	0	0.0	0	0.0
Route 2C	0	0.0	0	0.0
Route 5C	0	0.0	0	0.0
OP 2	335	5.6	1,995	33.2
OP 3	654	10.9	1,177	19.6
OP 4	385	6.4	1,434	23.9
OP 5	622	10.4	1,482	24.7
OP 6	441	7.3	2,395	39.9
OP 7	913	15.2	941	15.7
OP 8	1,058	17.6	845	14.1
OP 9	325	5.4	1,663	27.7
OP 17	1,509	25.1	428	7.1
OP 18	1,058	17.6	666	11.1
OP 19	803	13.4	632	10.5
OP 21	449	7.5	1,175	19.6
OP 22	470	7.8	2,260	37.7
OP 23	613	10.2	2,681	44.7
OP 24	772	12.9	3,414	56.9
OP 25	652	10.9	2,903	48.4
OP 26	568	9.5	2,678	44.6
OP 27	727	12.1	3,063	51.0
OP 28	656	10.9	2,882	48.0
OP 29	591	9.8	2,664	44.4
OP 30	585	9.8	2,632	43.9
OP 31	564	9.4	1,032	17.2
OP 14	1,172	19.5	0	0.0
OP 15	1,319	22.0	0	0.0

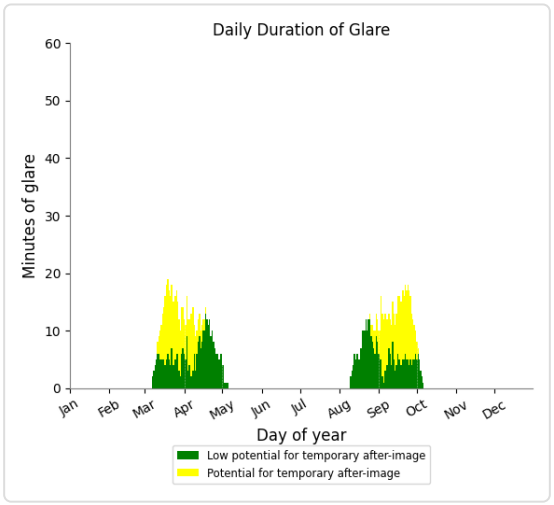
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 16	1,530	25.5	0	0.0
OP 32	60	1.0	0	0.0
OP 1	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0

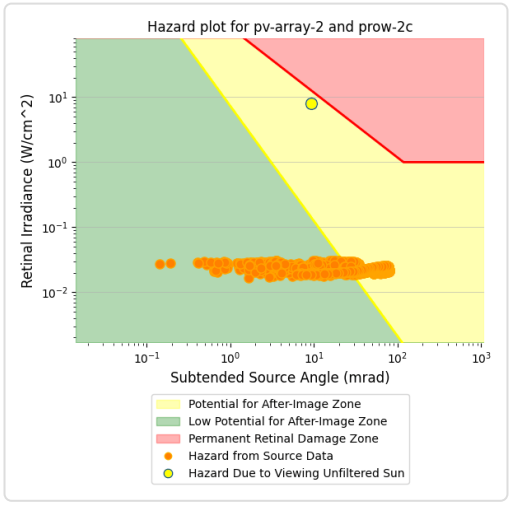
PV array 2 and Route: PRoW 2C

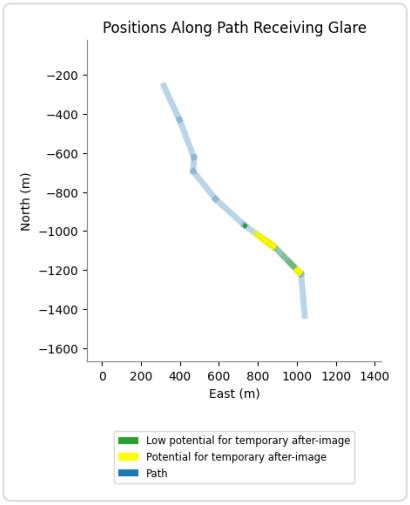
Yellow glare: 591 min.

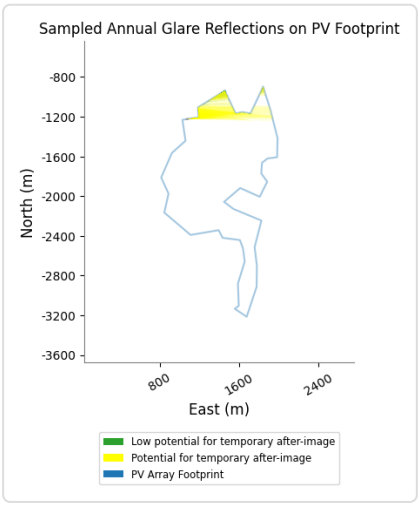
Green glare: 671 min.







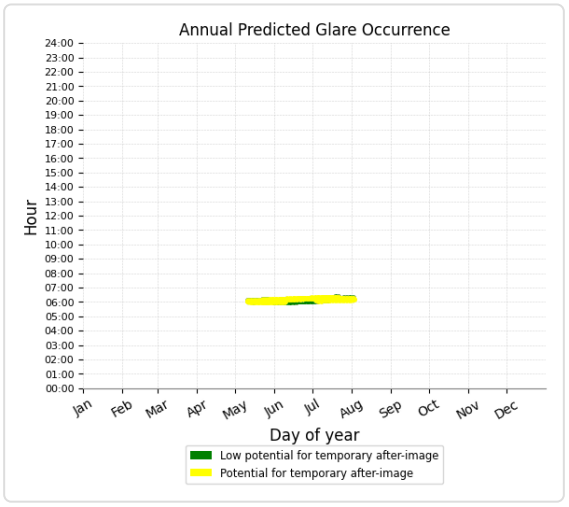


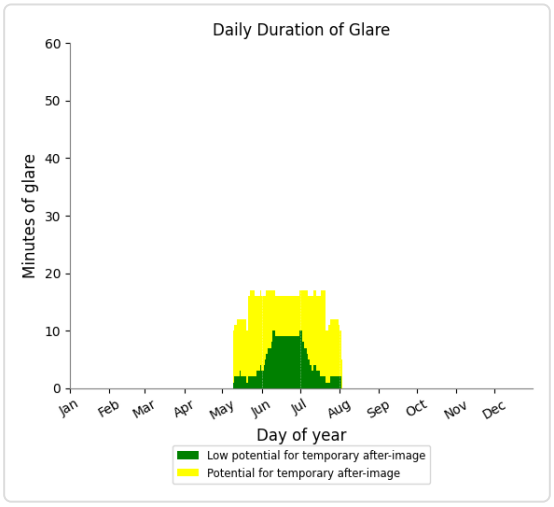


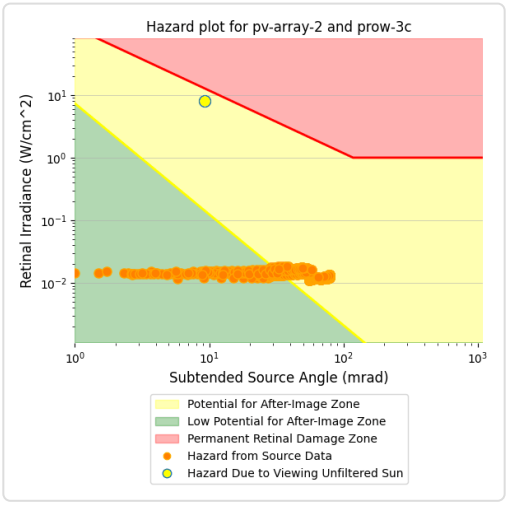
PV array 2 and Route: PRoW 3C

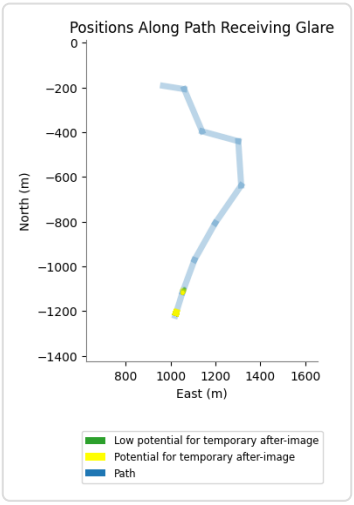
Yellow glare: 870 min.

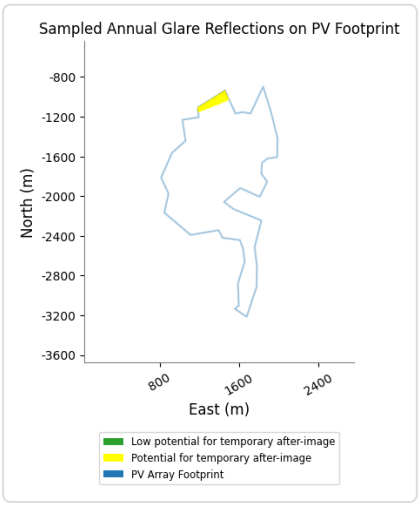
Green glare: 408 min.







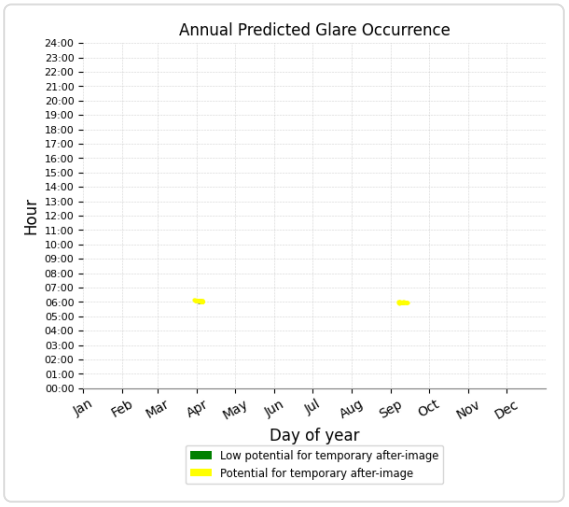


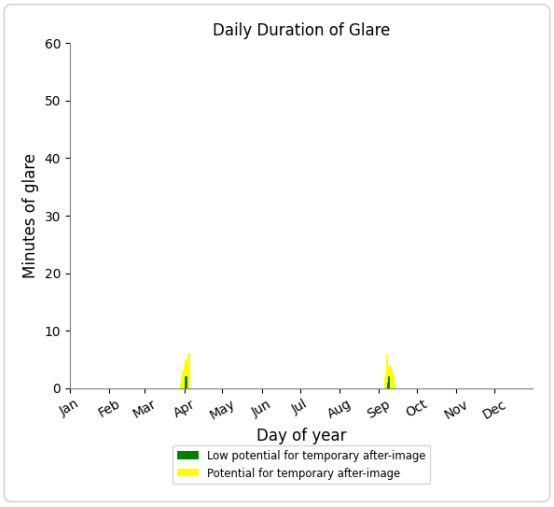


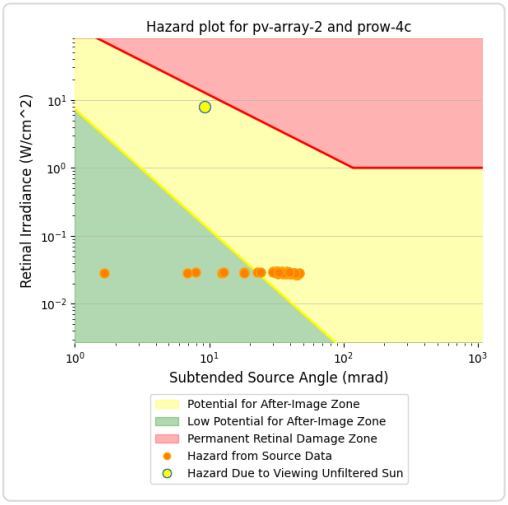
PV array 2 and Route: PRoW 4C

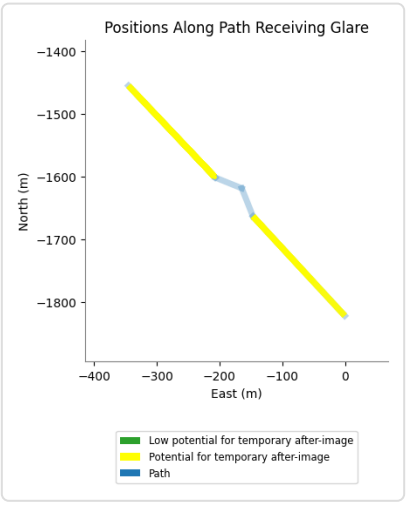
Yellow glare: 55 min.

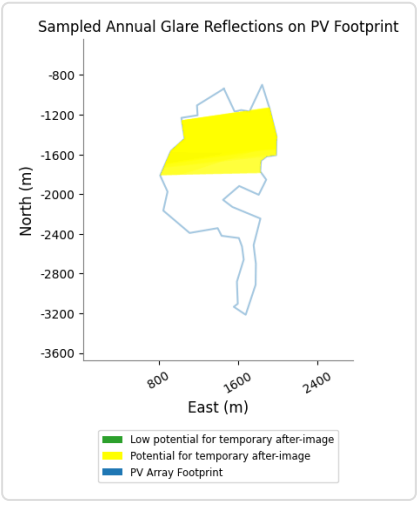
Green glare: 7 min.







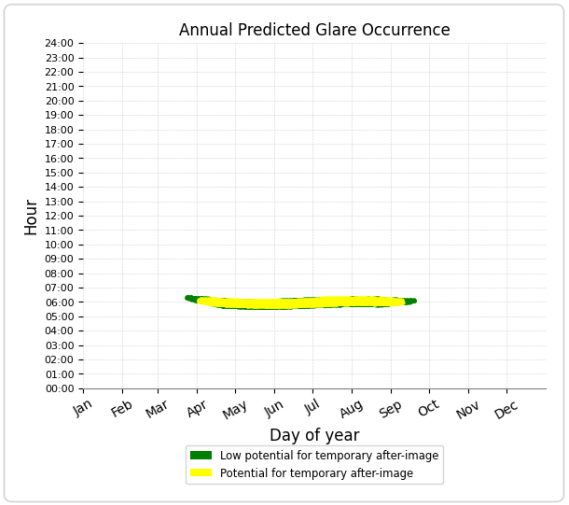


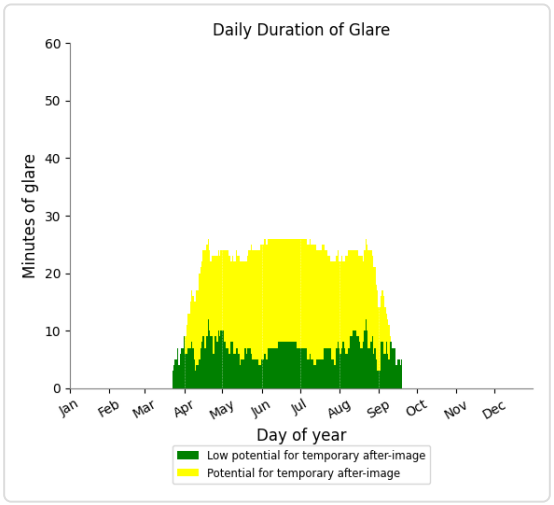


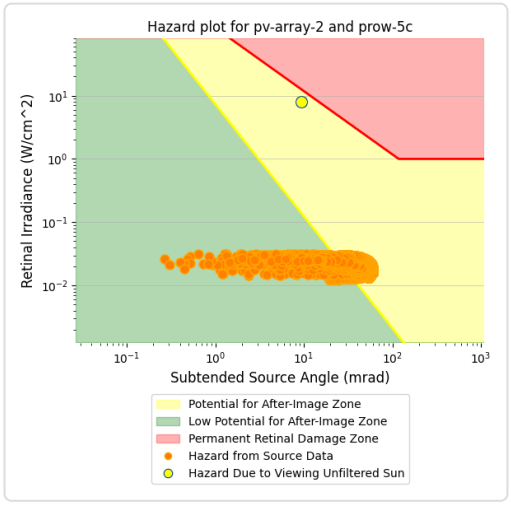
PV array 2 and Route: PRoW 5C

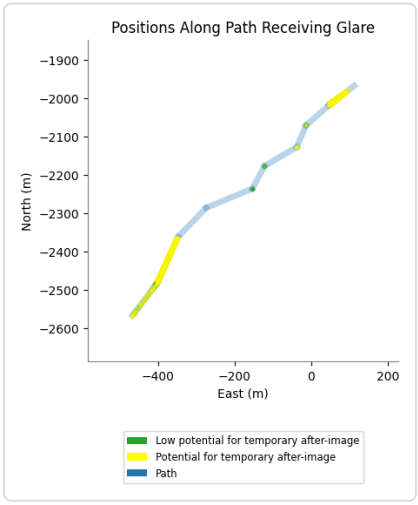
Yellow glare: 2,563 min.

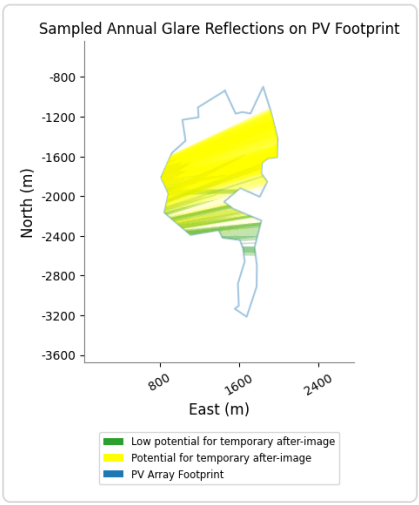
Green glare: 1,220 min.







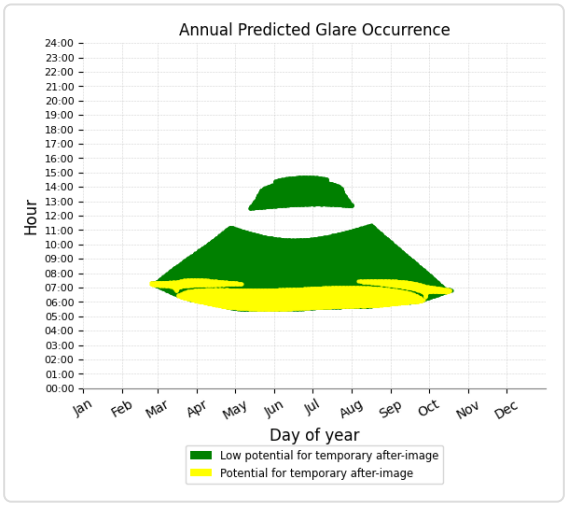


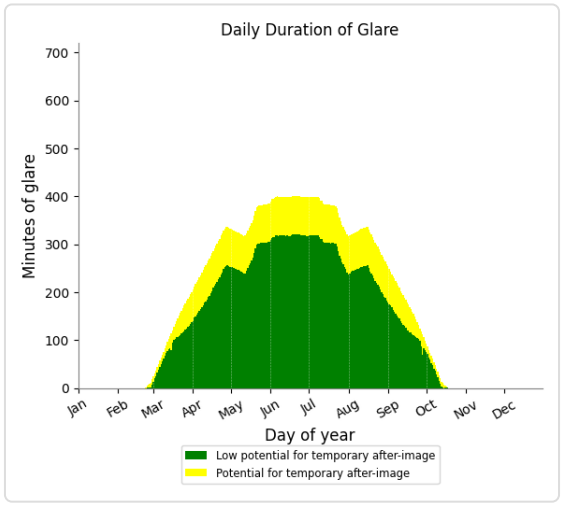


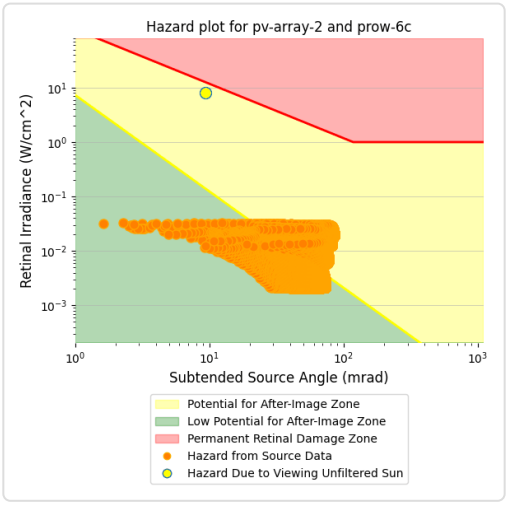
PV array 2 and Route: PRoW 6C

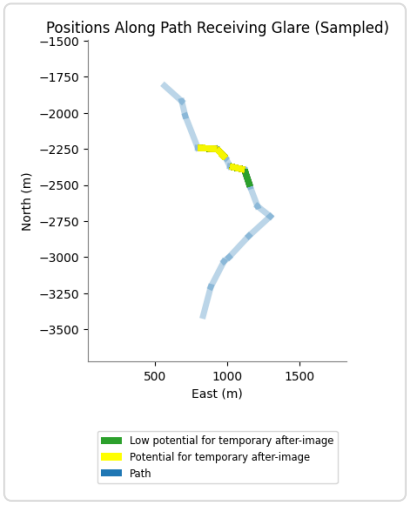
Yellow glare: 14,879 min.

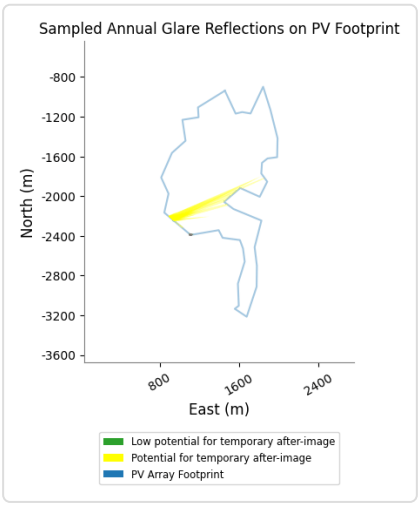
Green glare: 47,443 min.







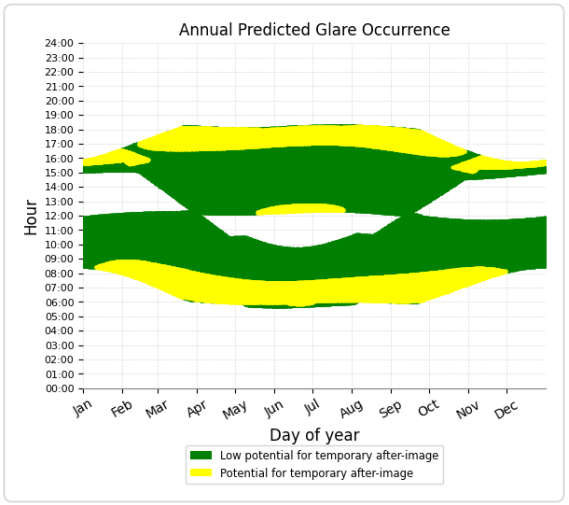


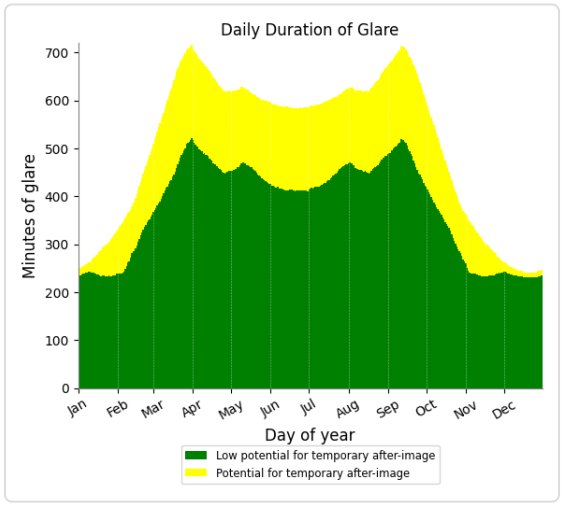


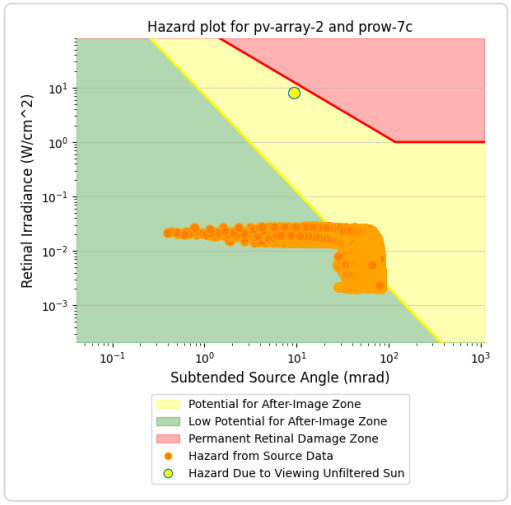
PV array 2 and Route: PRoW 7C

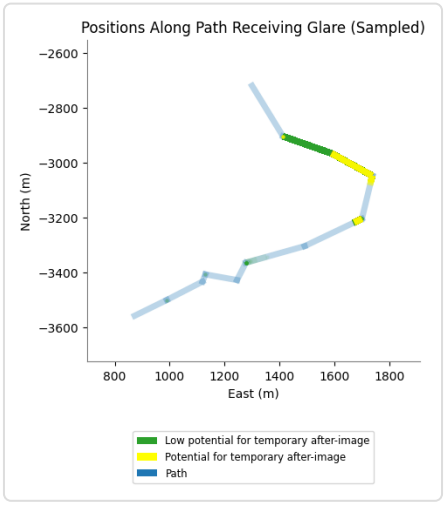
Yellow glare: 48,454 min.

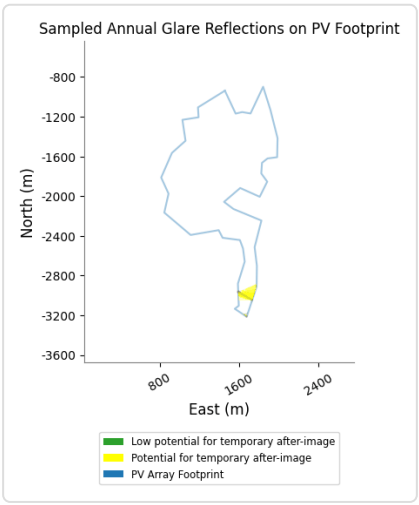
Green glare: 137,687 min.







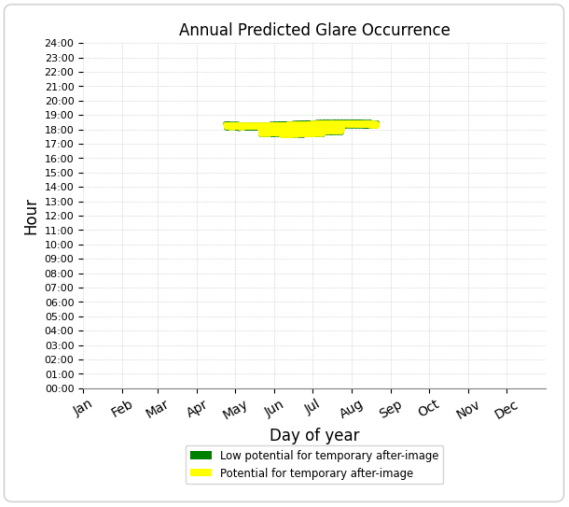


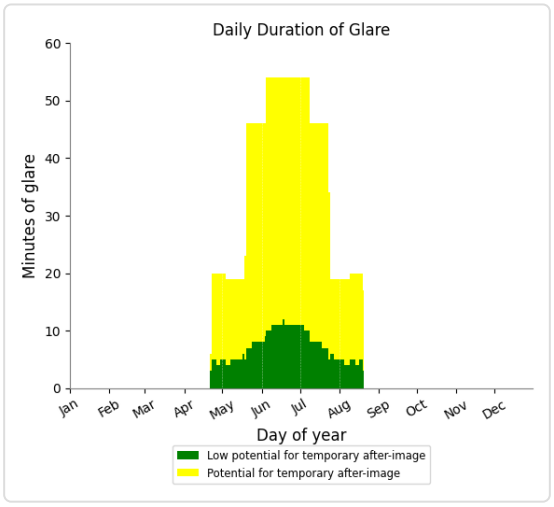


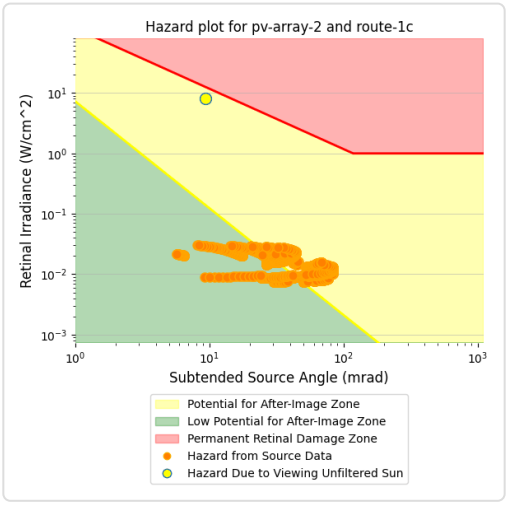
PV array 2 and Route: Route 1C

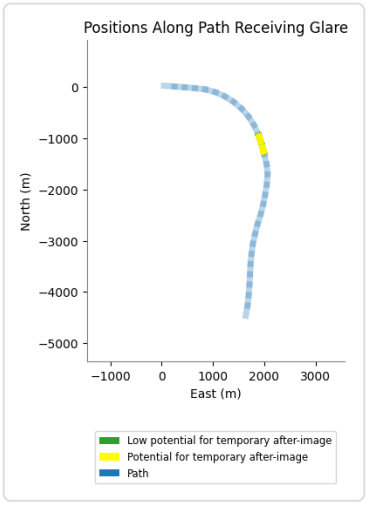
Yellow glare: 3,479 min.

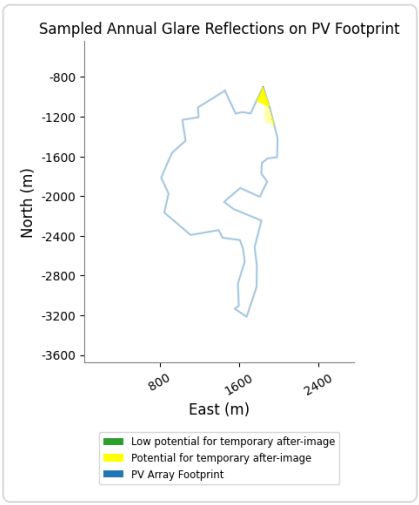
Green glare: 872 min.







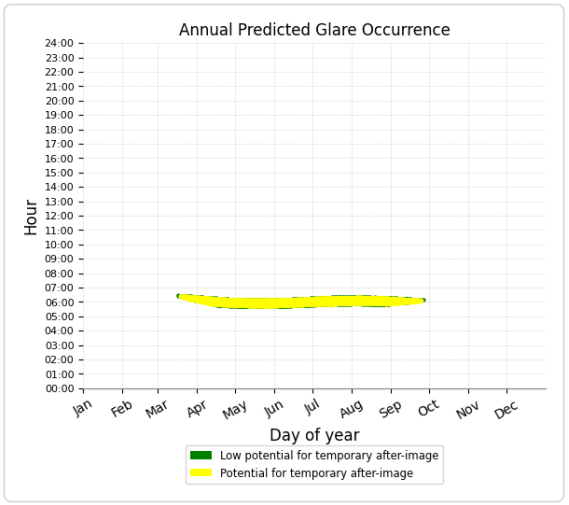


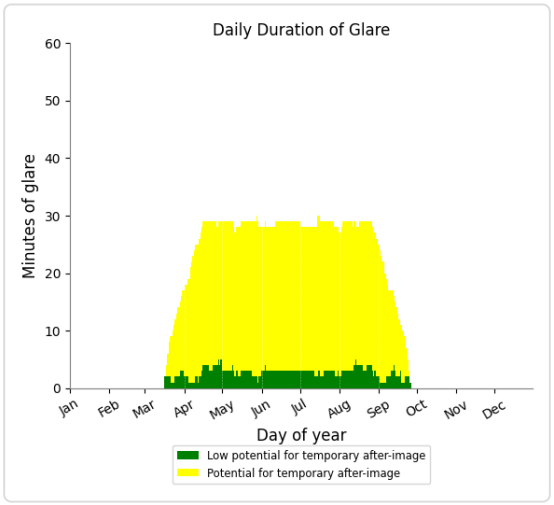


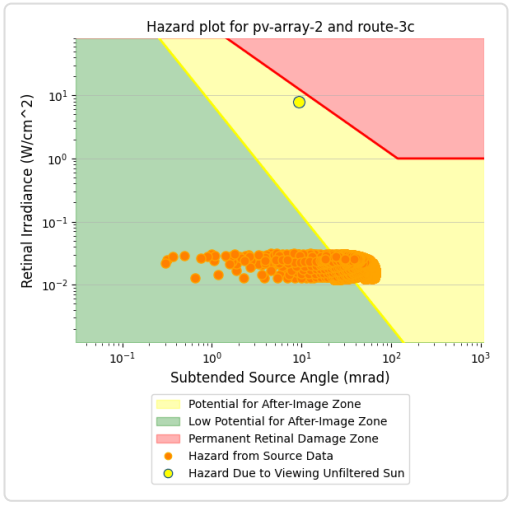
PV array 2 and Route: Route 3C

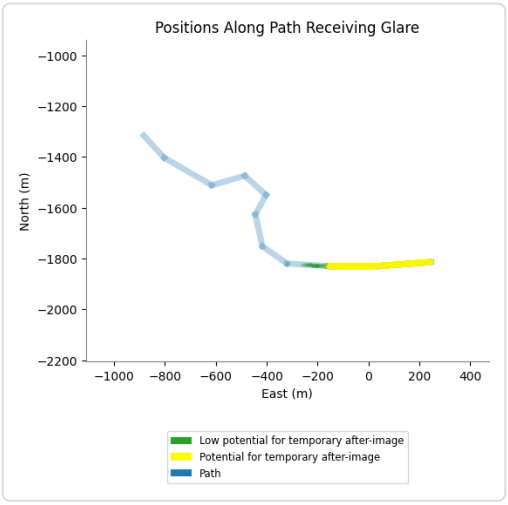
Yellow glare: 4,300 min.

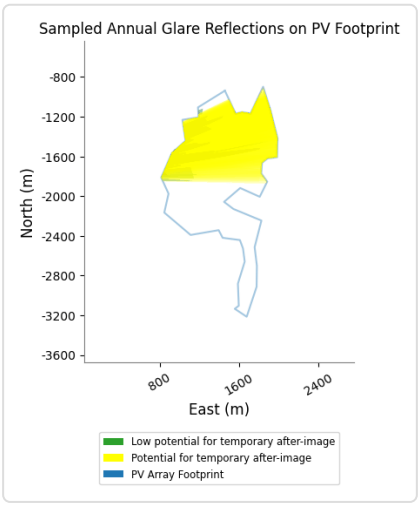
Green glare: 522 min.







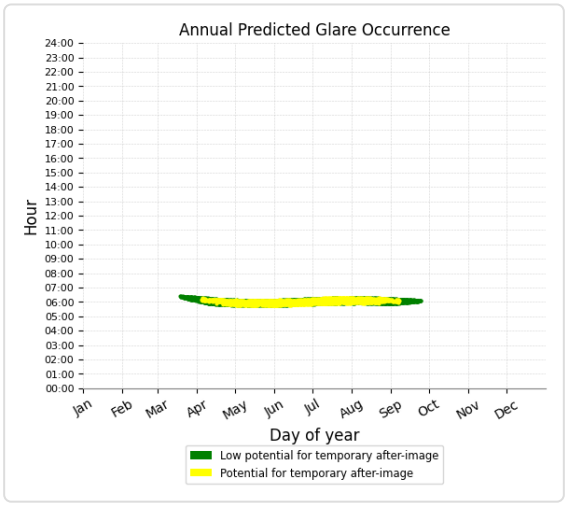


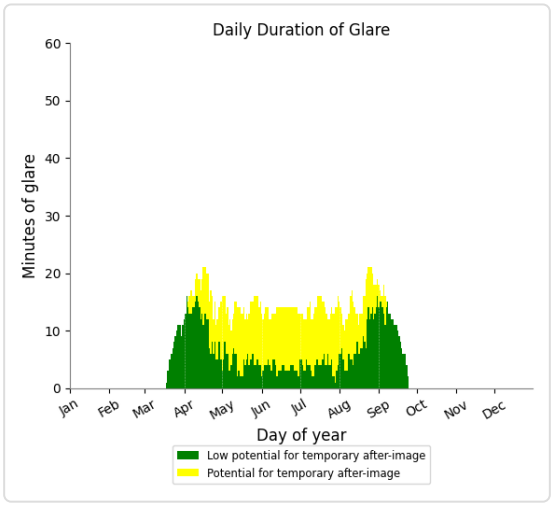


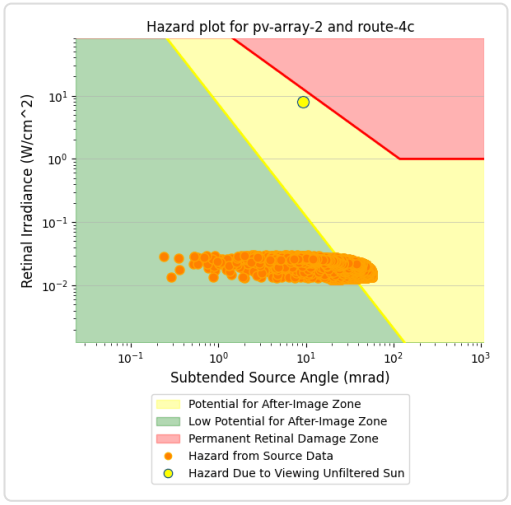
PV array 2 and Route: Route 4C

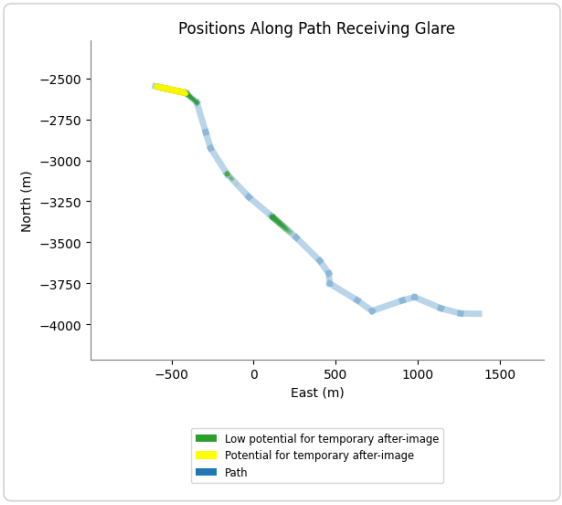
Yellow glare: 1,312 min.

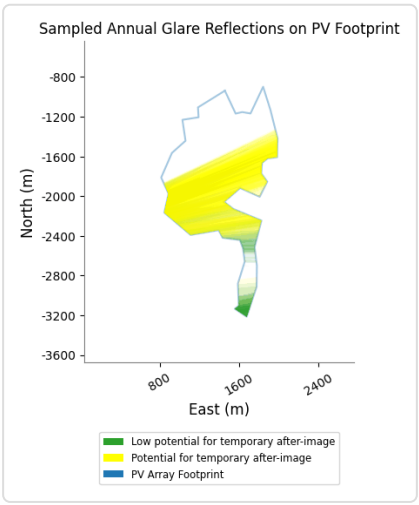
Green glare: 1,305 min.







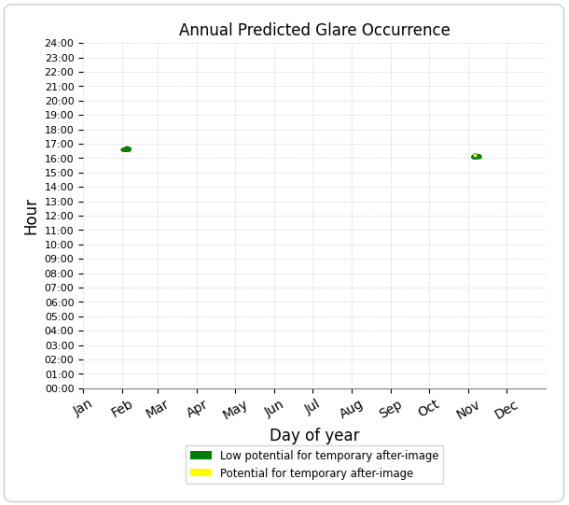


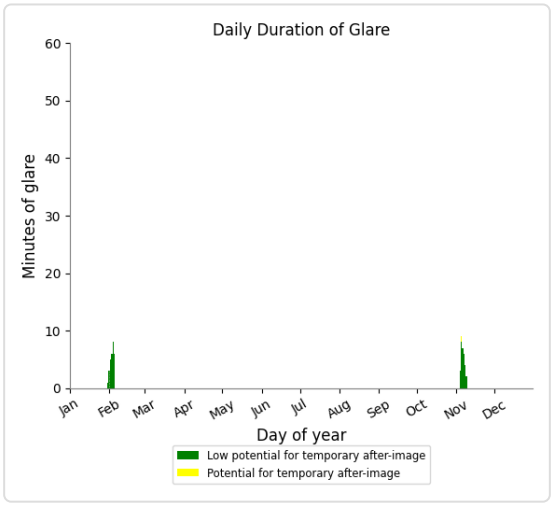


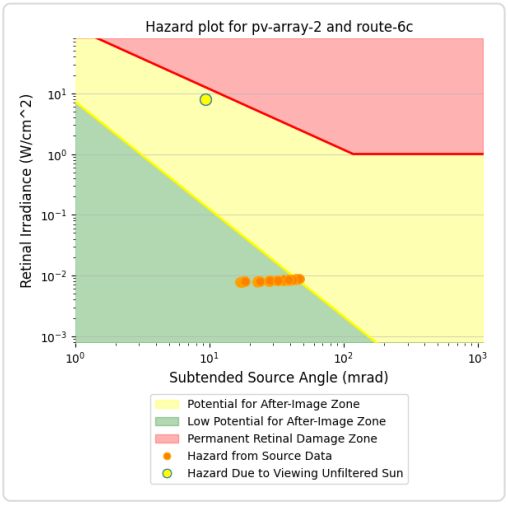
PV array 2 and Route: Route 6C

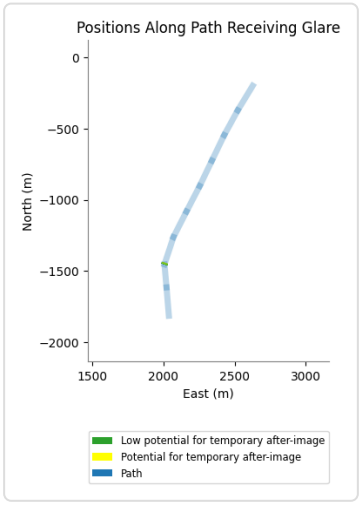
Yellow glare: 1 min.

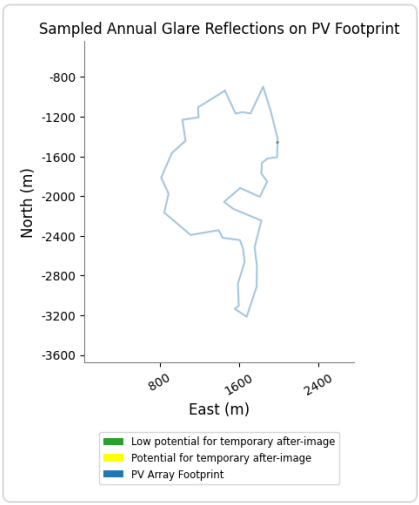
Green glare: 59 min.











PV array 2 and Route: PRoW 1C

No glare found

PV array 2 and Route: PRoW 9C

No glare found

PV array 2 and Route: Route 1C - Part 2

No glare found

PV array 2 and Route: Route 2C

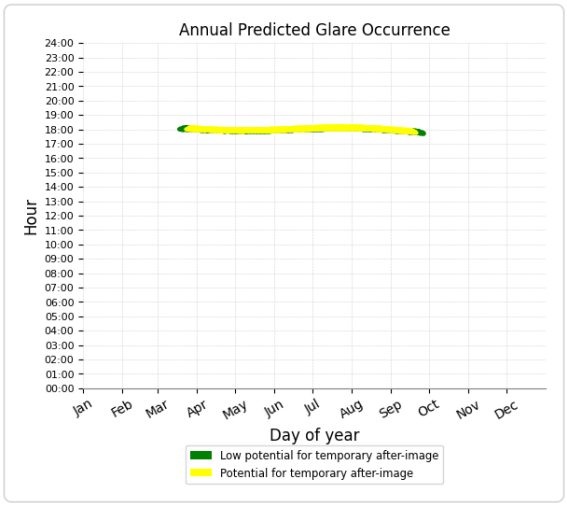
No glare found

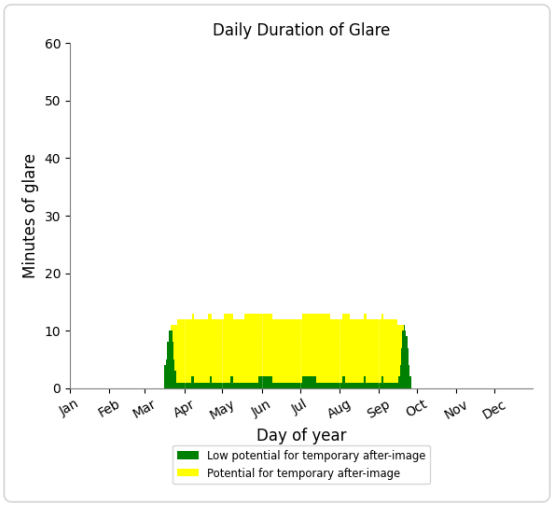
PV array 2 and Route: Route 5C

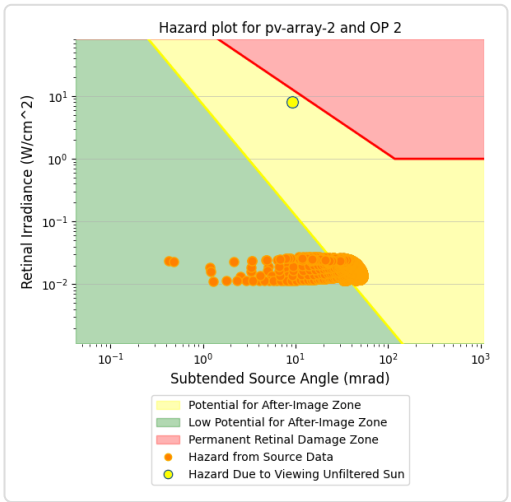
No glare found

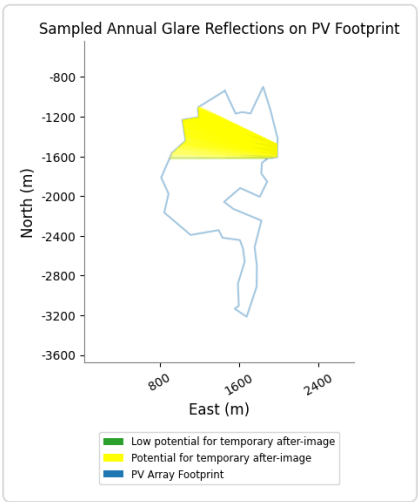
PV array 2 and OP 2

Yellow glare: 1,995 min.
Green glare: 335 min.





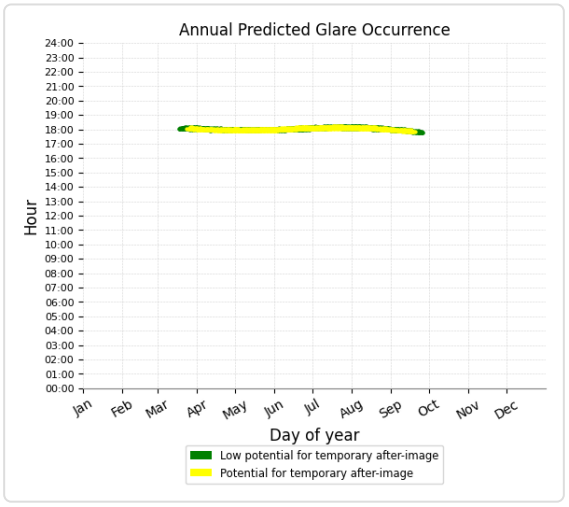


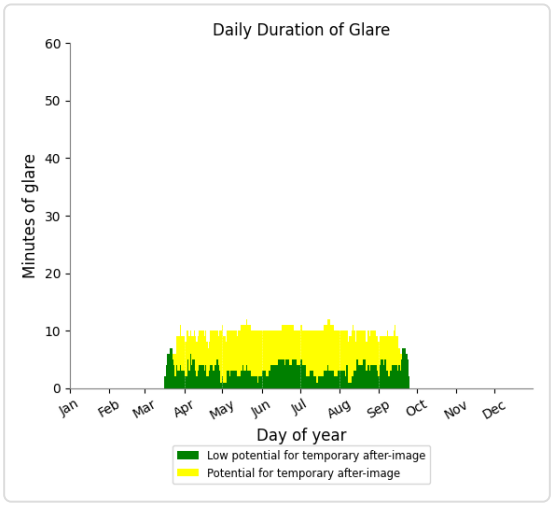


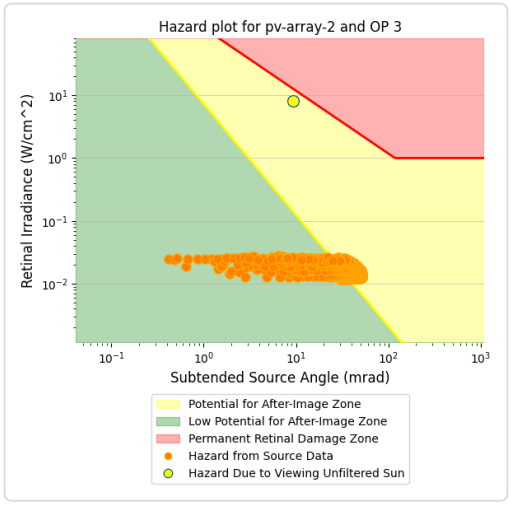
PV array 2 and OP 3

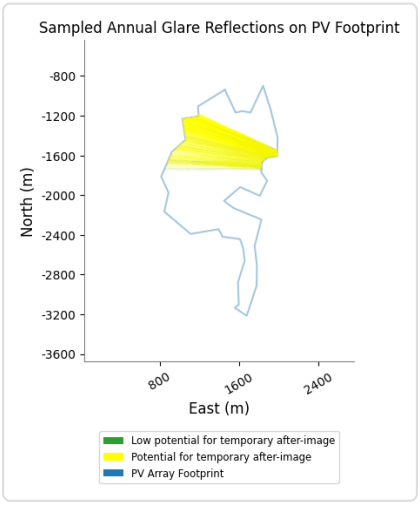
Yellow glare: 1,177 min.

Green glare: 654 min.





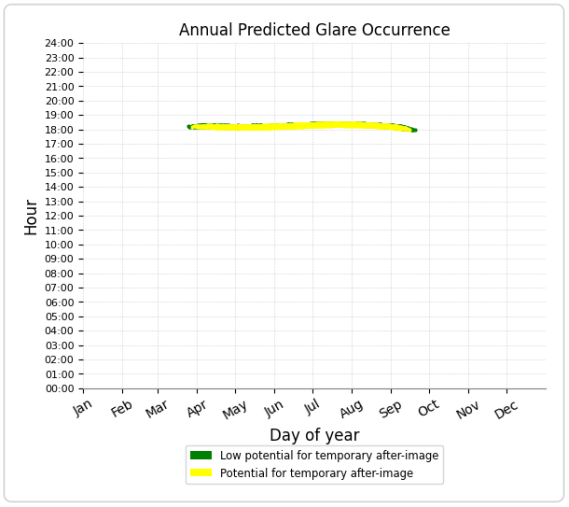


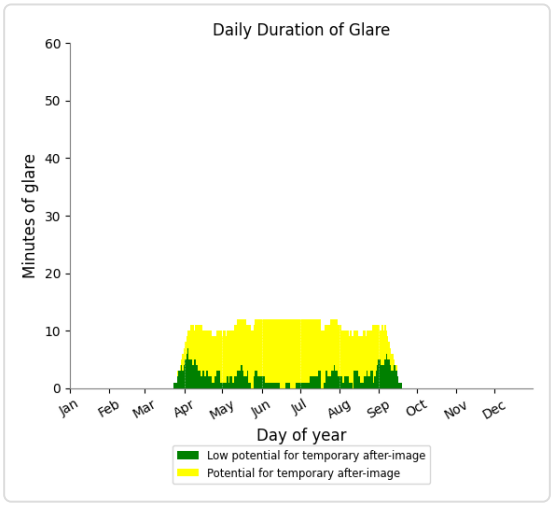


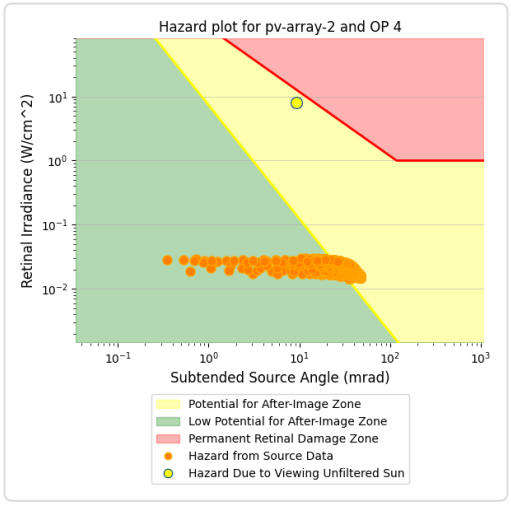
PV array 2 and OP 4

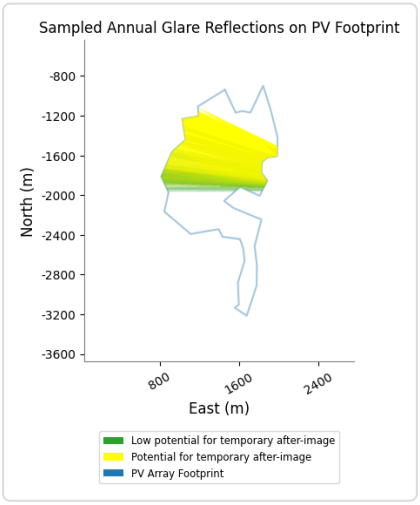
Yellow glare: 1,434 min.

Green glare: 385 min.





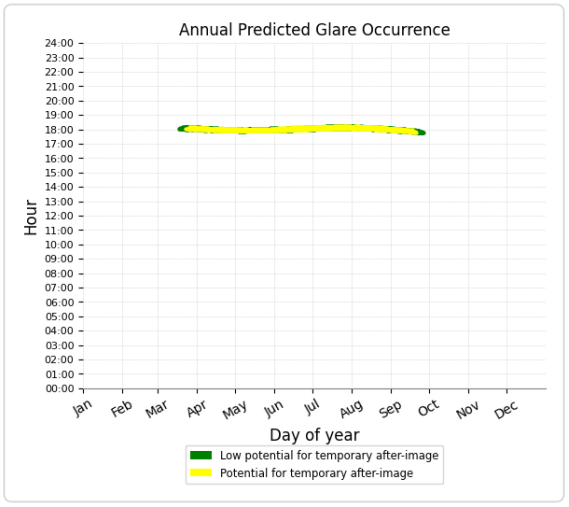


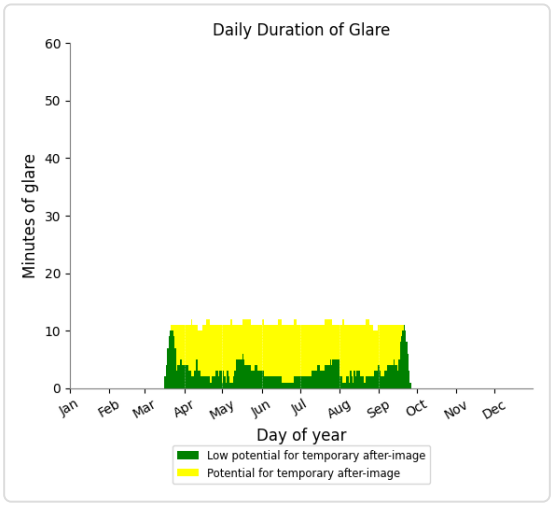


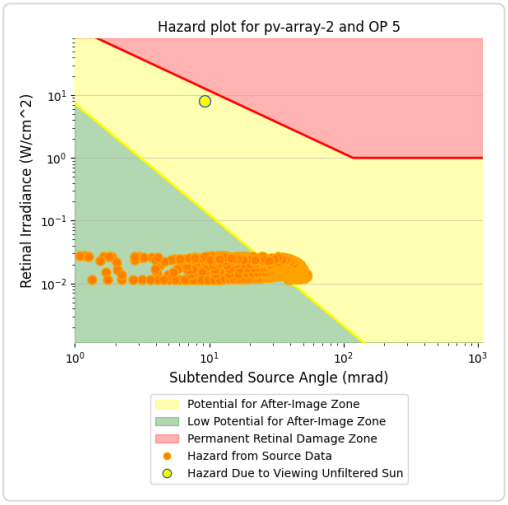
PV array 2 and OP 5

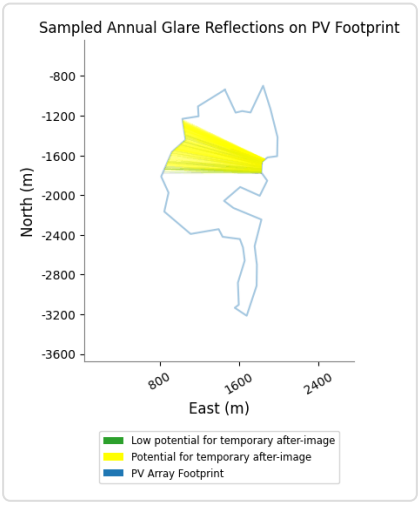
Yellow glare: 1,482 min.

Green glare: 622 min.





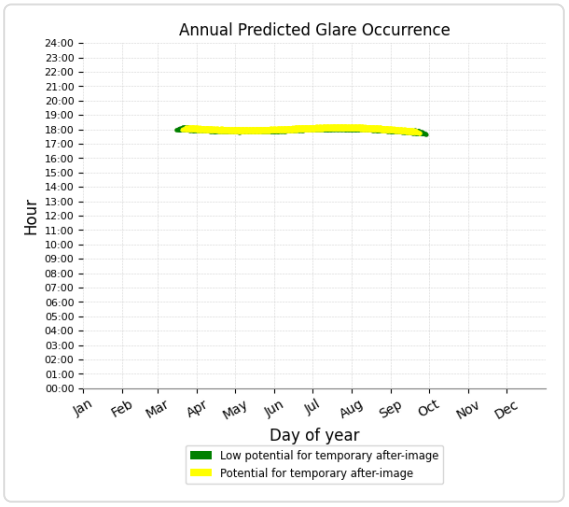


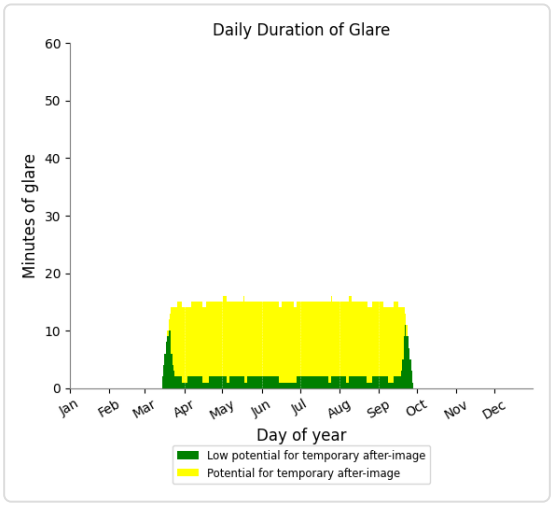


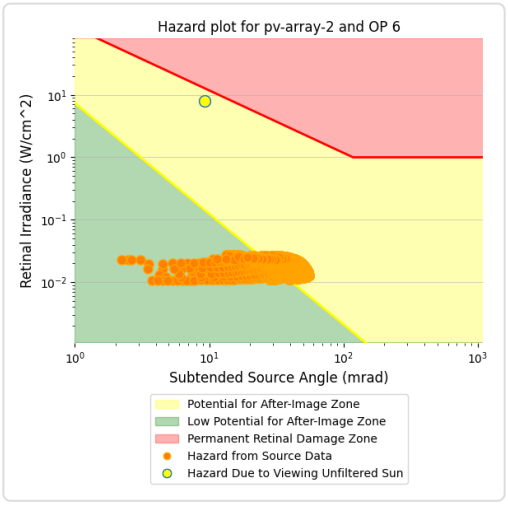
PV array 2 and OP 6

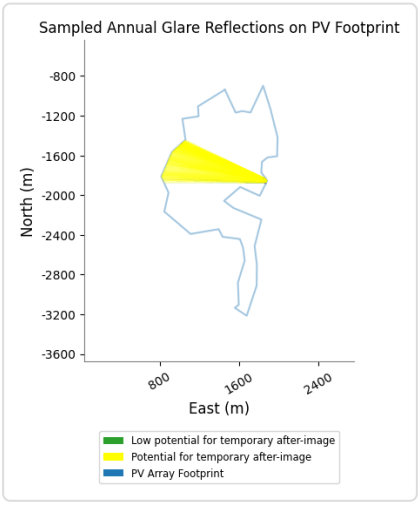
Yellow glare: 2,395 min.

Green glare: 441 min.





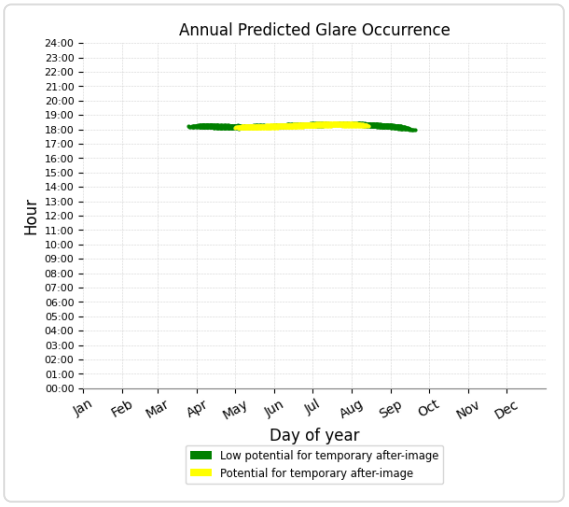


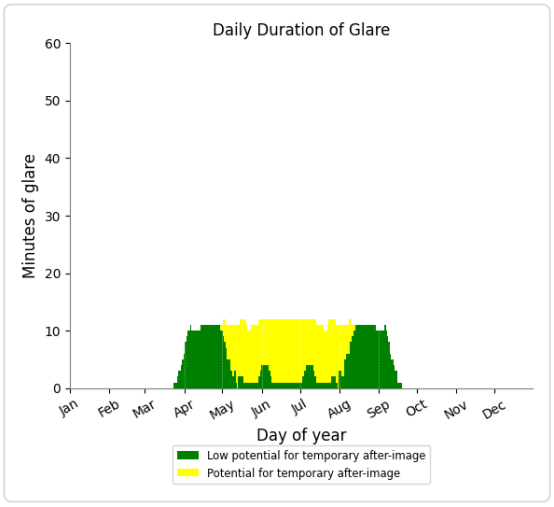


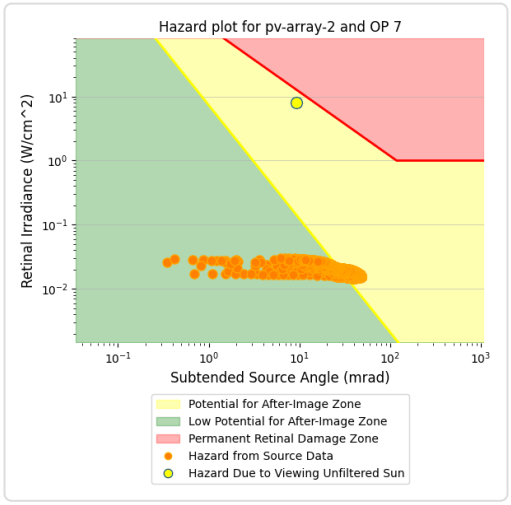
PV array 2 and OP 7

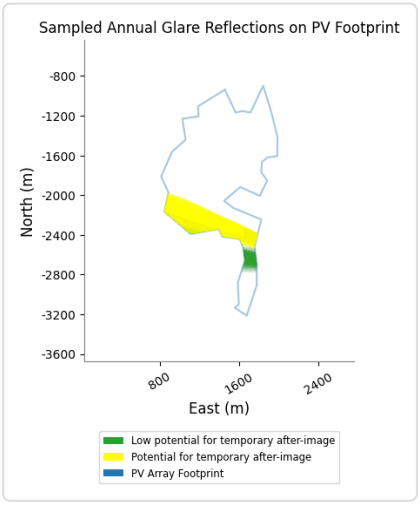
Yellow glare: 941 min.

Green glare: 913 min.





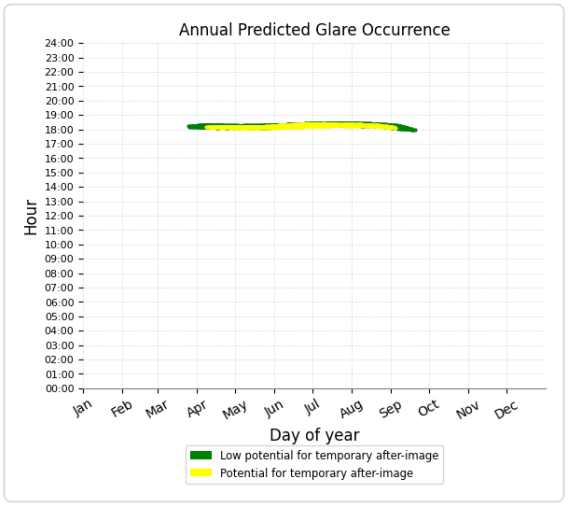


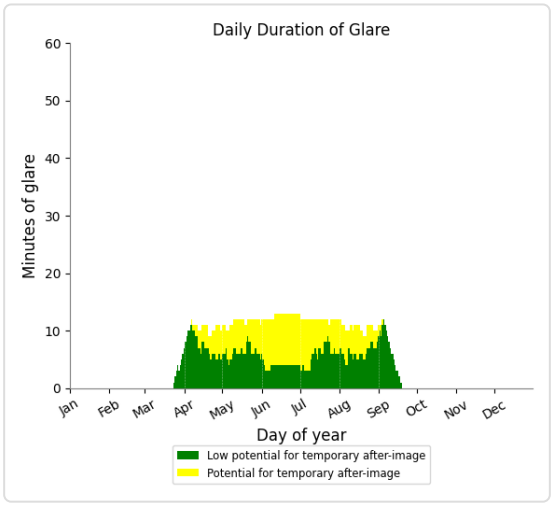


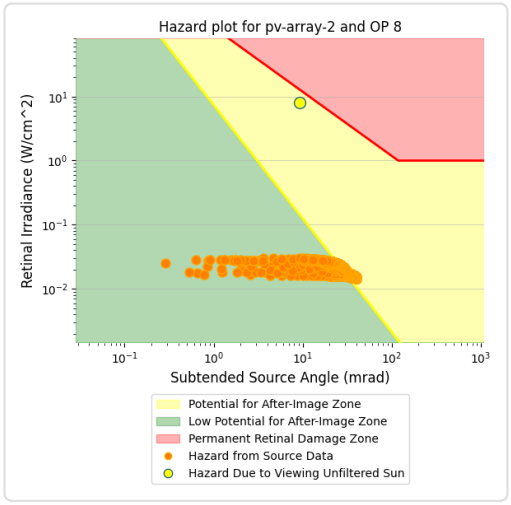
PV array 2 and OP 8

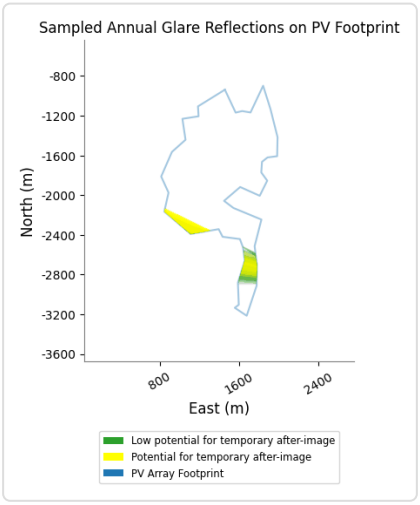
Yellow glare: 845 min.

Green glare: 1,058 min.





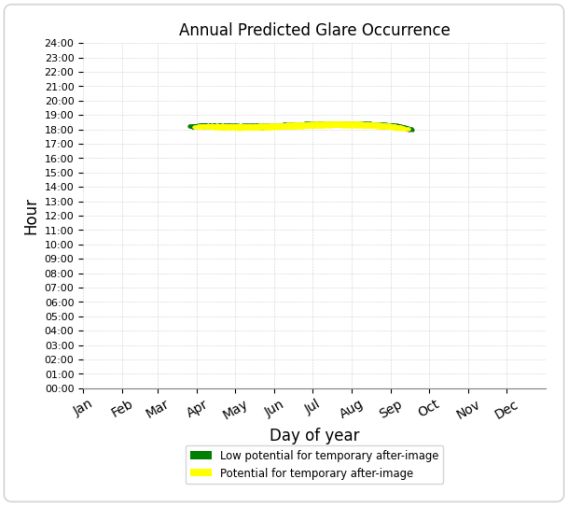


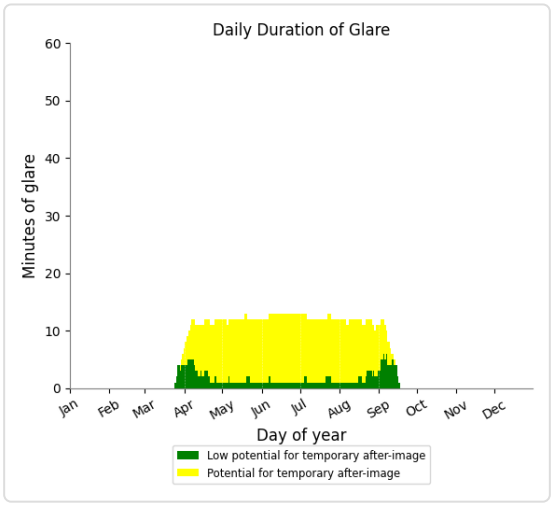


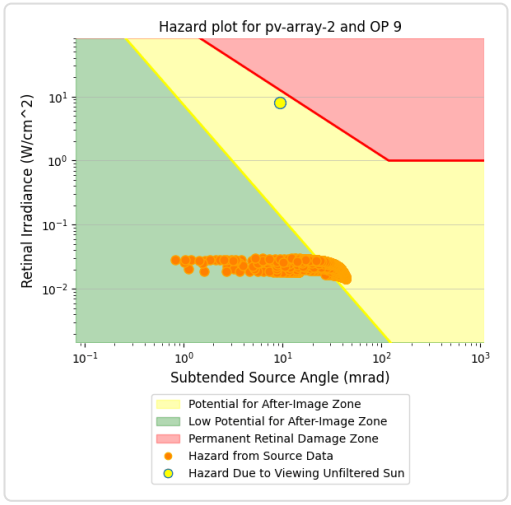
PV array 2 and OP 9

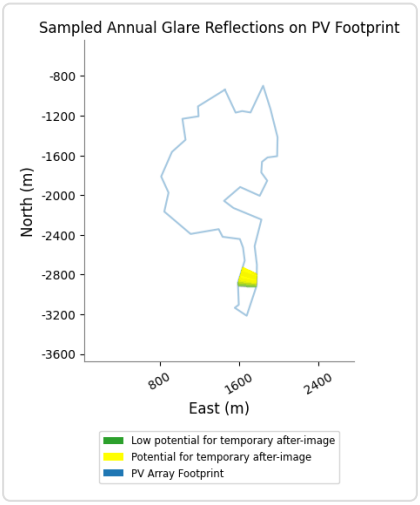
Yellow glare: 1,663 min.

Green glare: 325 min.





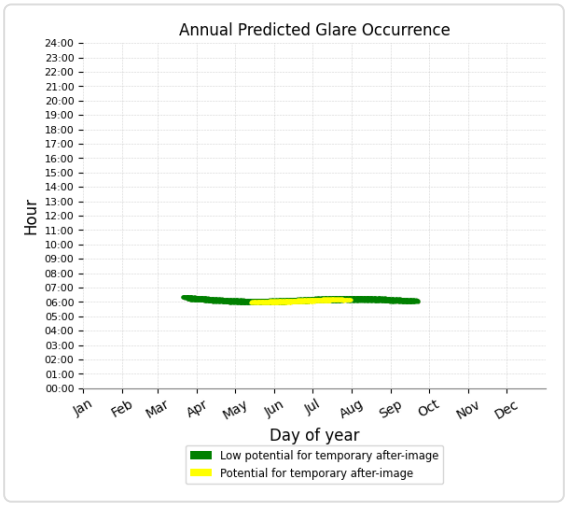


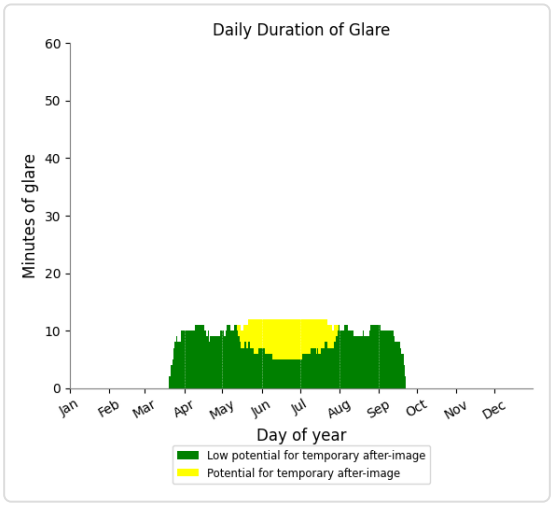


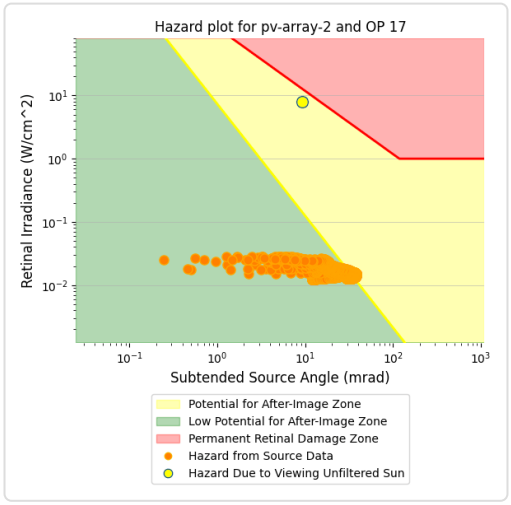
PV array 2 and OP 17

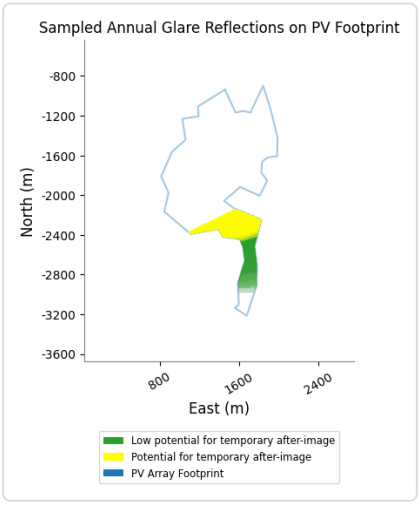
Yellow glare: 428 min.

Green glare: 1,509 min.





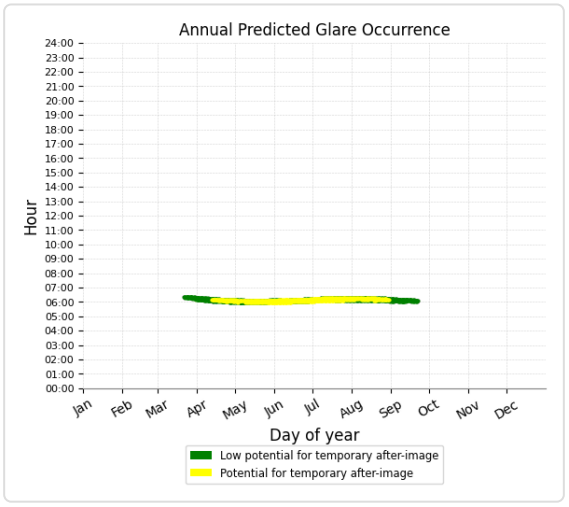


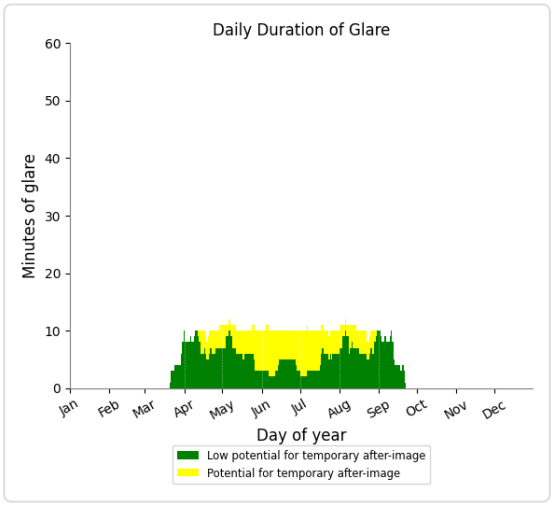


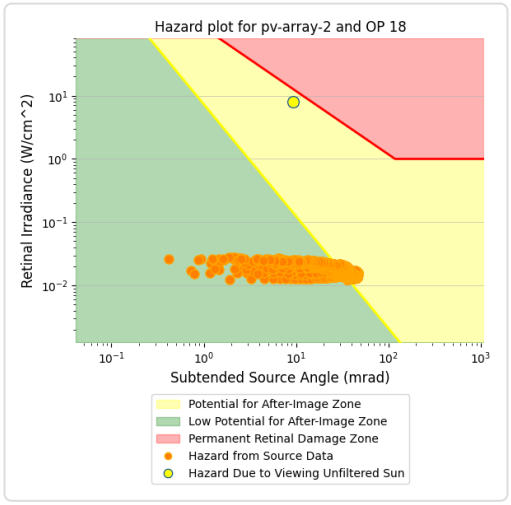
PV array 2 and OP 18

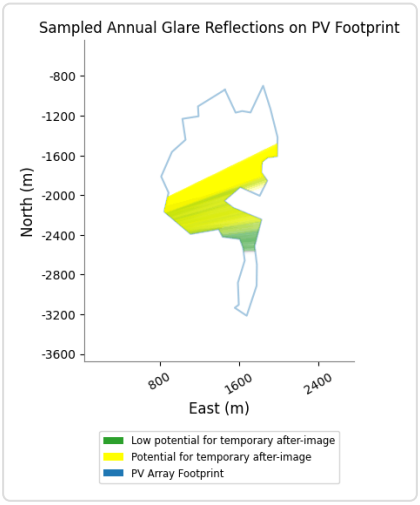
Yellow glare: 666 min.

Green glare: 1,058 min.





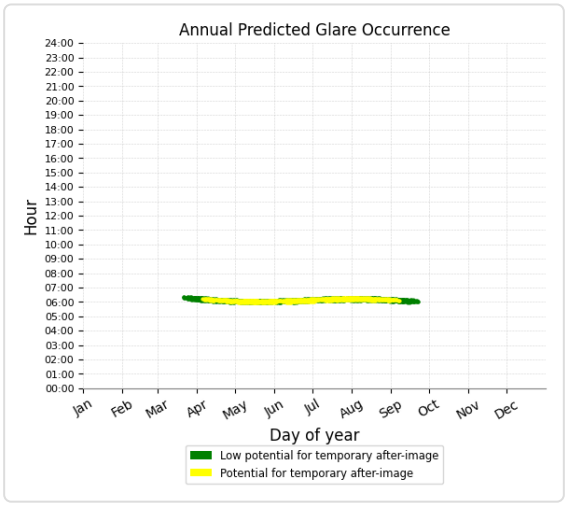


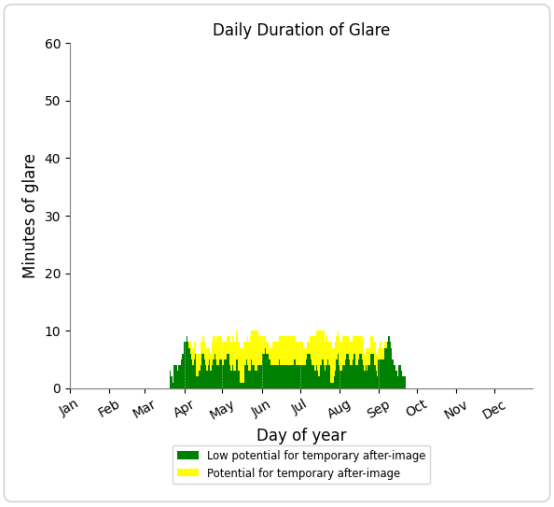


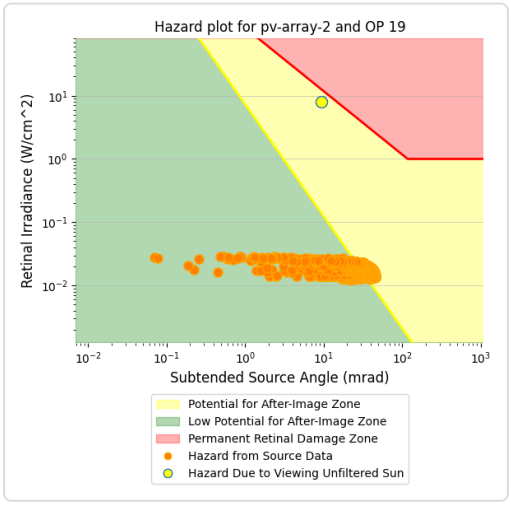
PV array 2 and OP 19

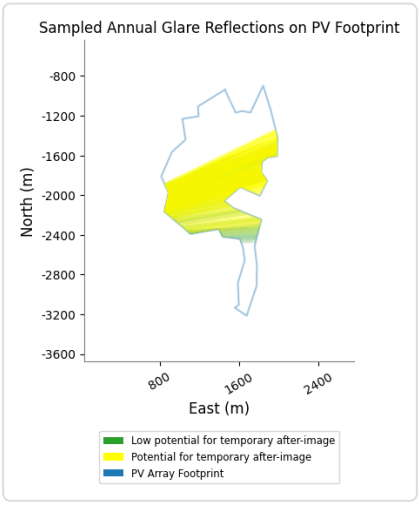
Yellow glare: 632 min.

Green glare: 803 min.





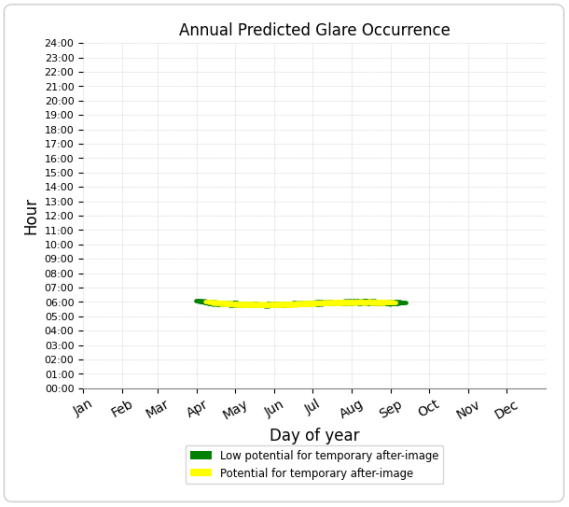


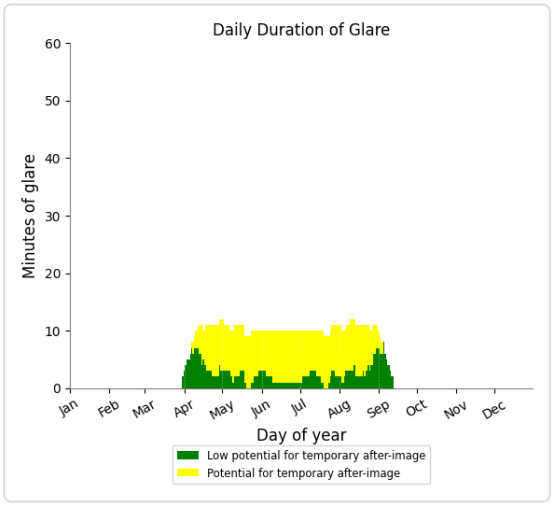


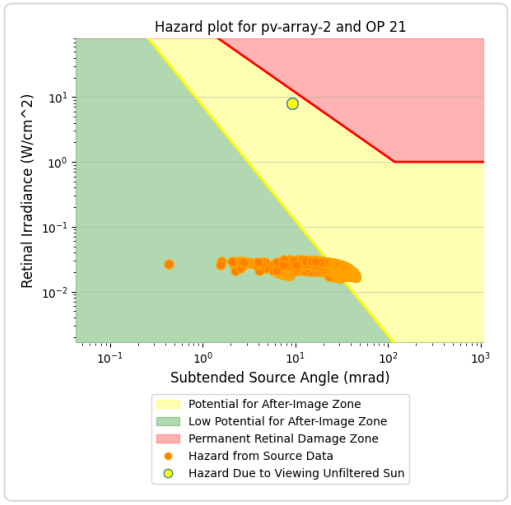
PV array 2 and OP 21

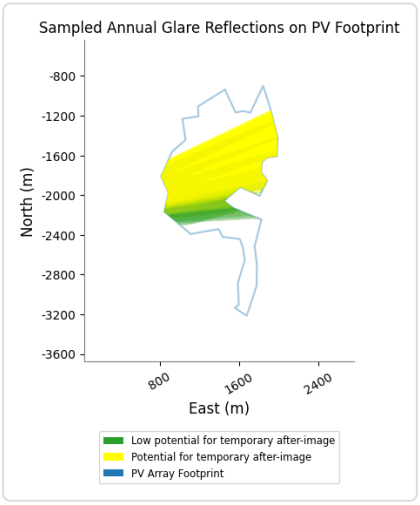
Yellow glare: 1,175 min.

Green glare: 449 min.





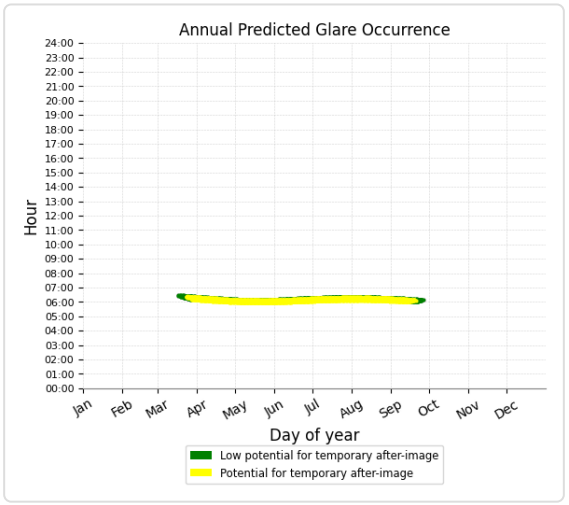


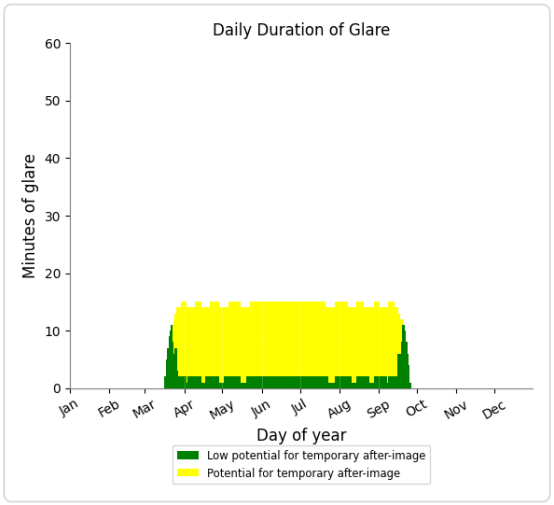


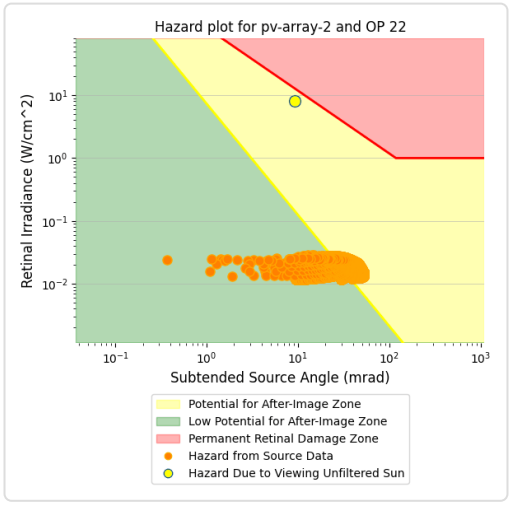
PV array 2 and OP 22

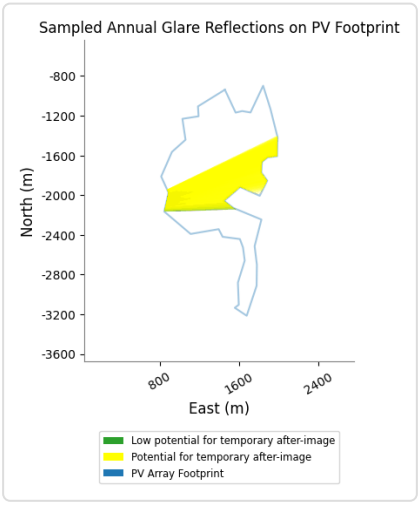
Yellow glare: 2,260 min.

Green glare: 470 min.





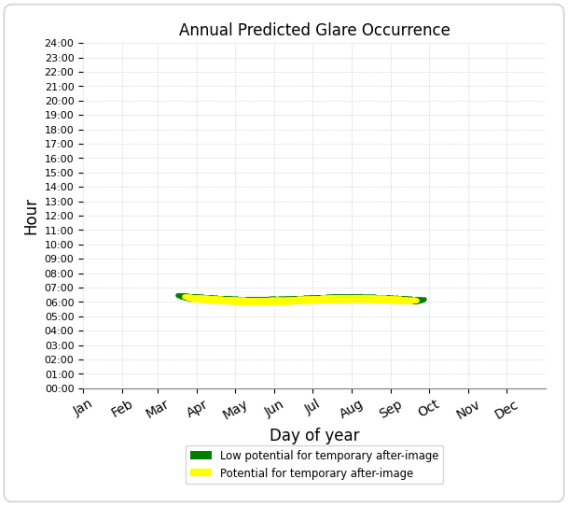


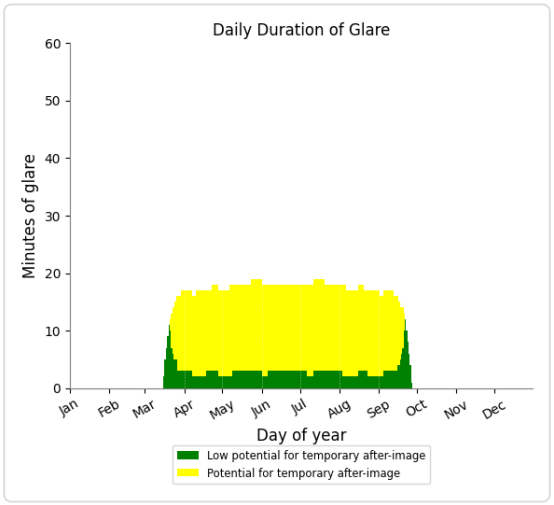


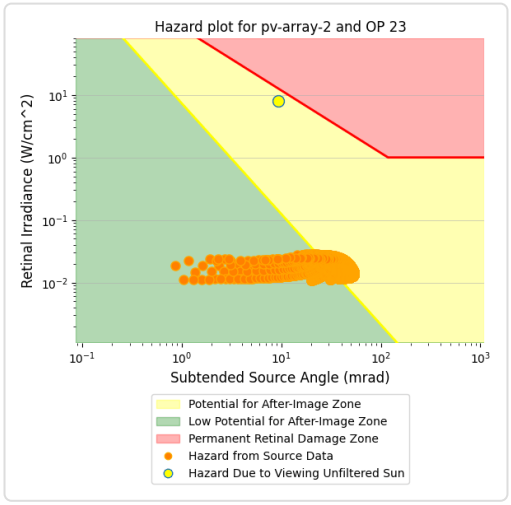
PV array 2 and OP 23

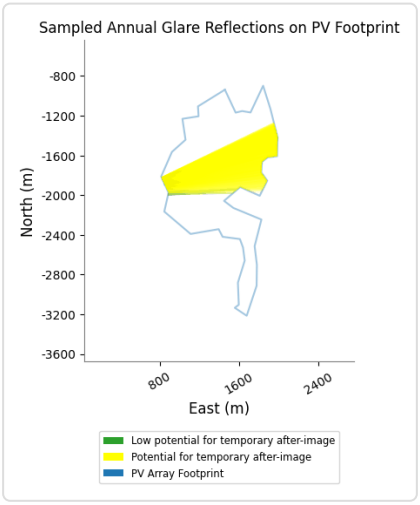
Yellow glare: 2,681 min.

Green glare: 613 min.





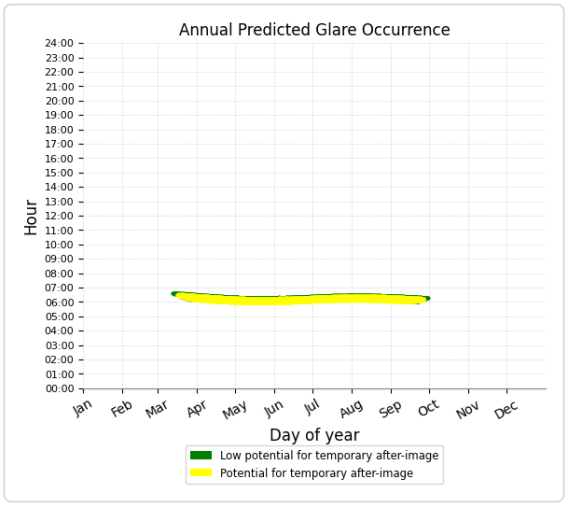


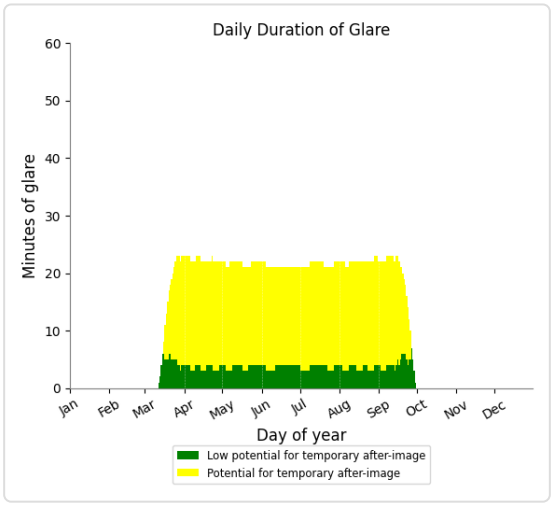


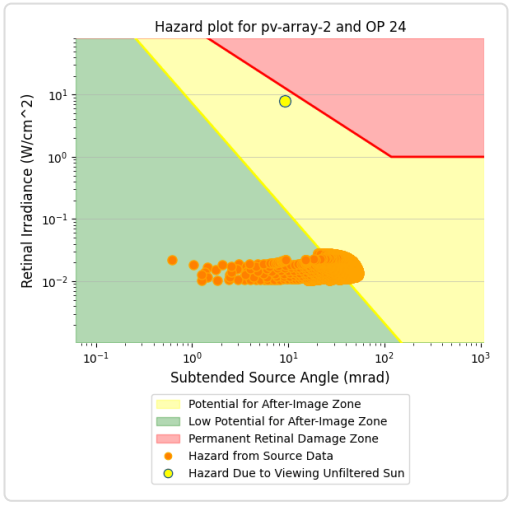
PV array 2 and OP 24

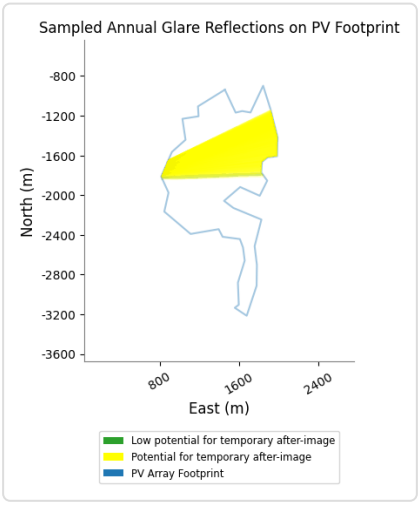
Yellow glare: 3,414 min.

Green glare: 772 min.





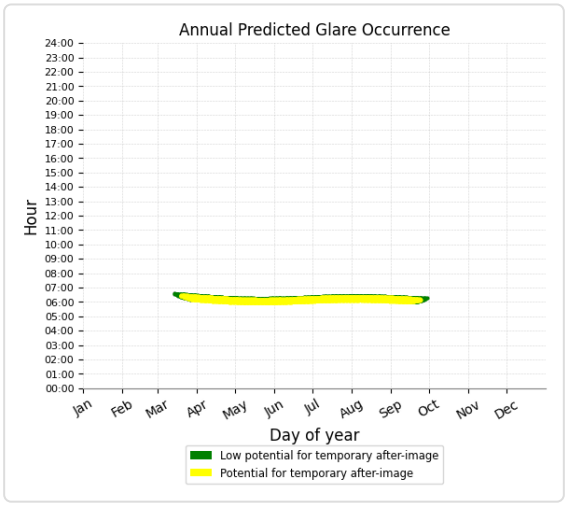


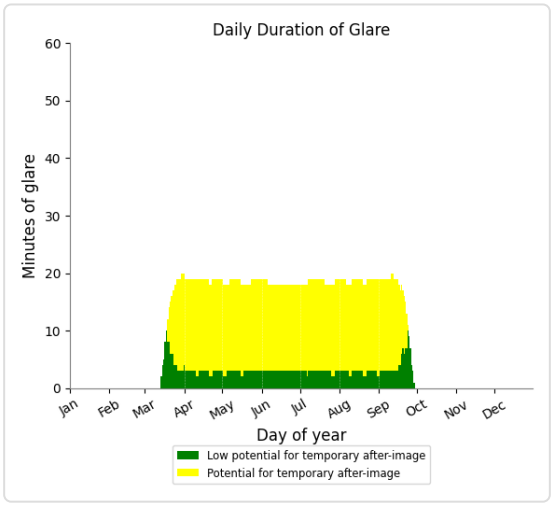


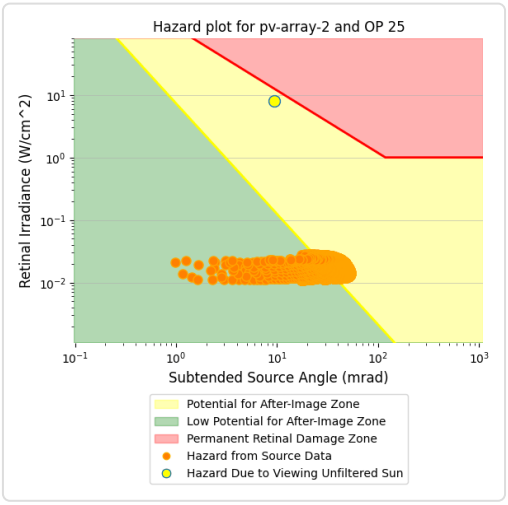
PV array 2 and OP 25

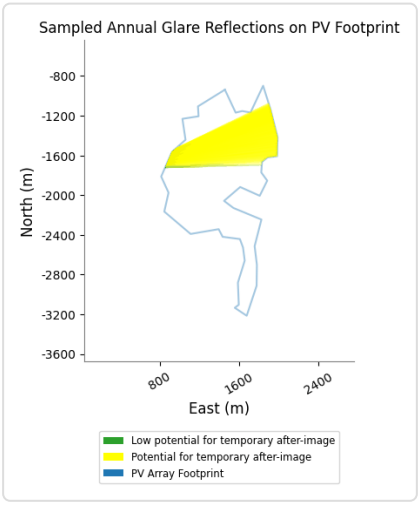
Yellow glare: 2,903 min.

Green glare: 652 min.





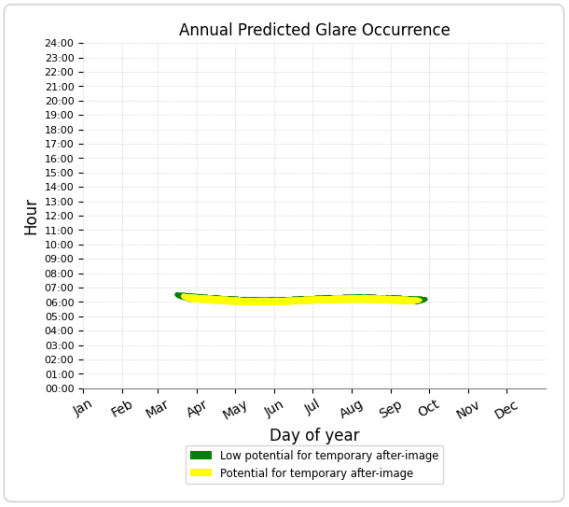


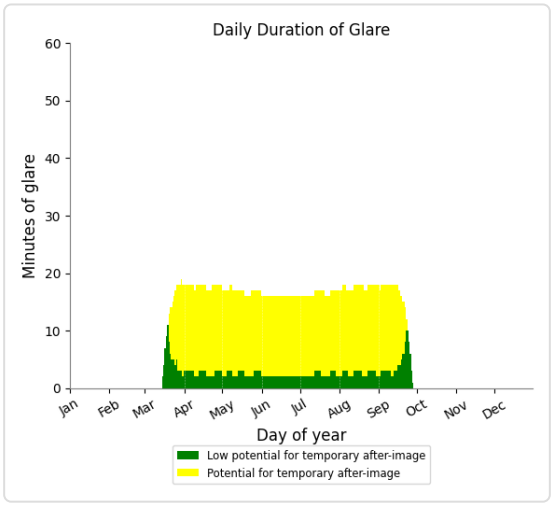


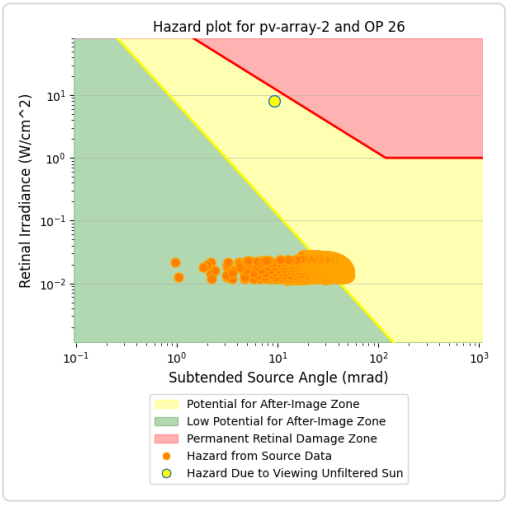
PV array 2 and OP 26

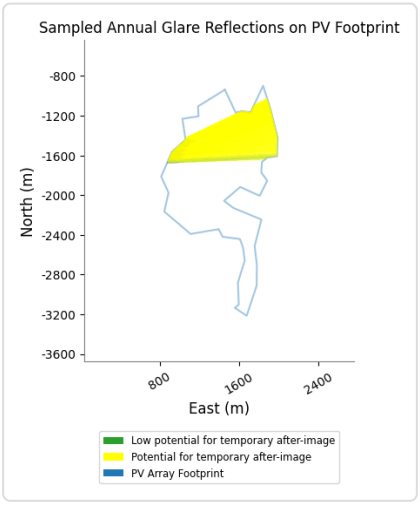
Yellow glare: 2,678 min.

Green glare: 568 min.





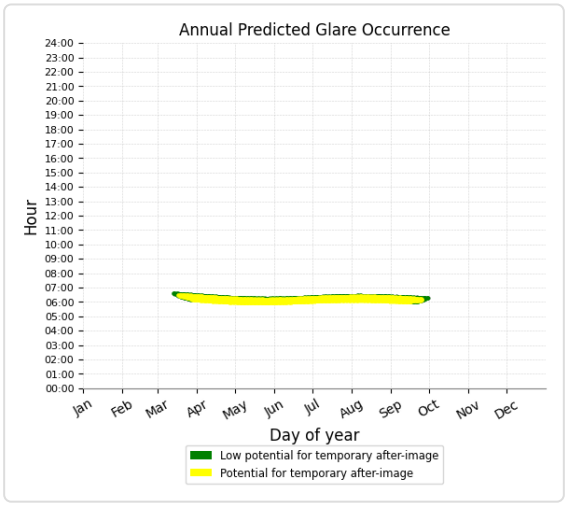


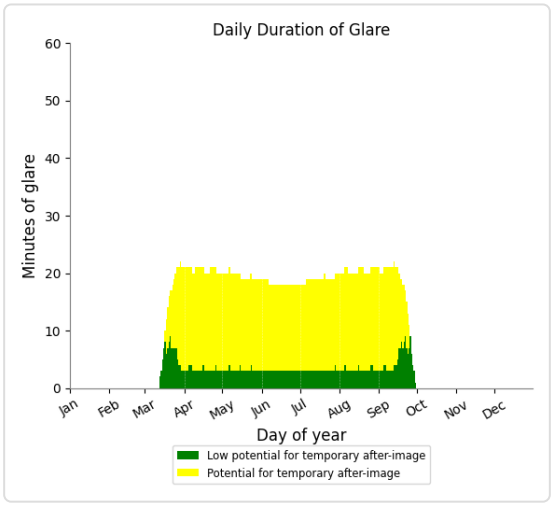


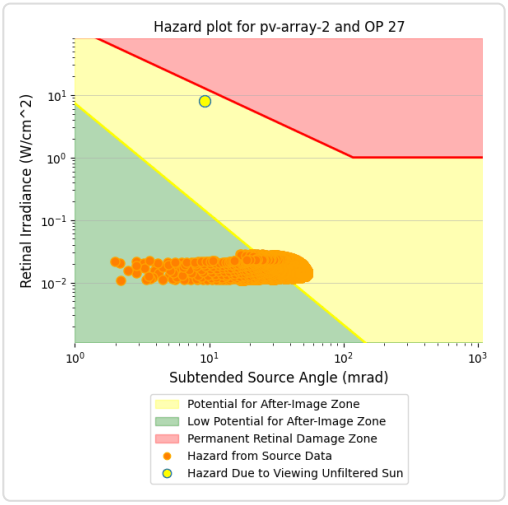
PV array 2 and OP 27

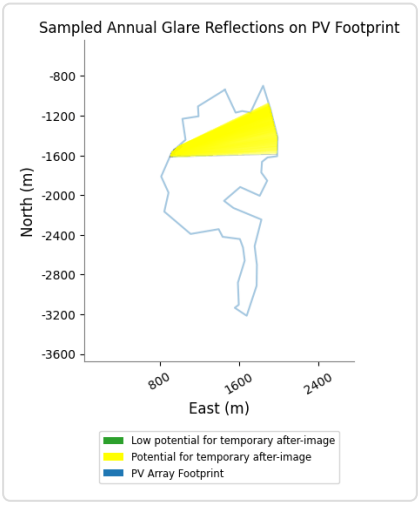
Yellow glare: 3,063 min.

Green glare: 727 min.





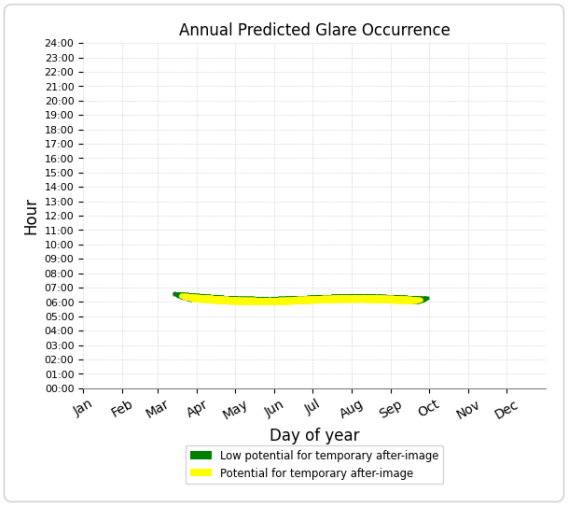


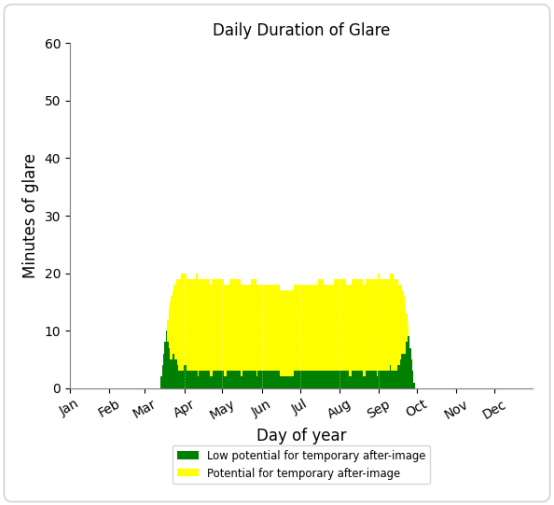


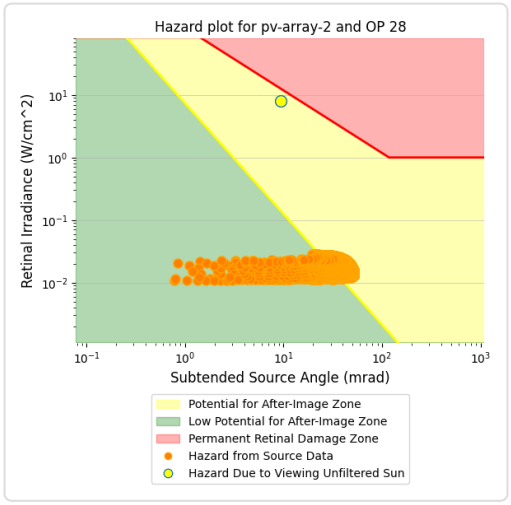
PV array 2 and OP 28

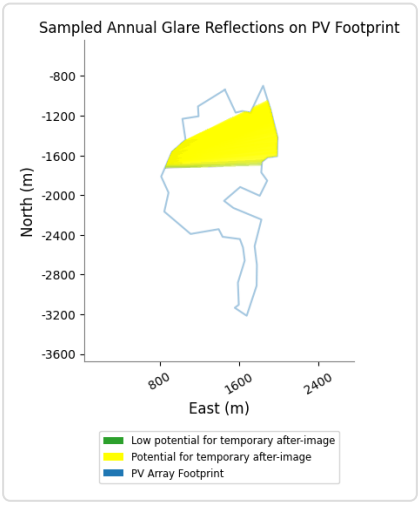
Yellow glare: 2,882 min.

Green glare: 656 min.





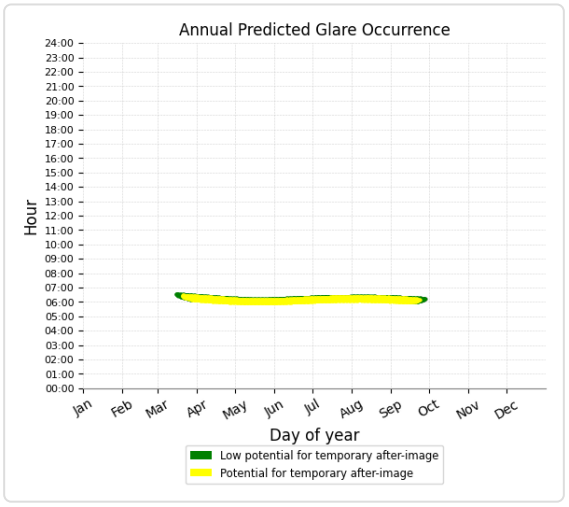


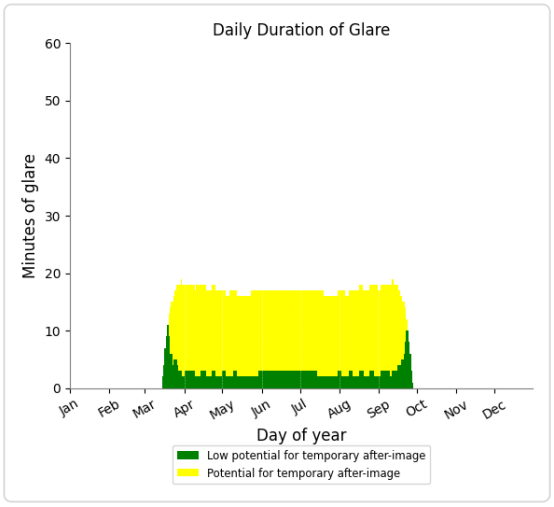


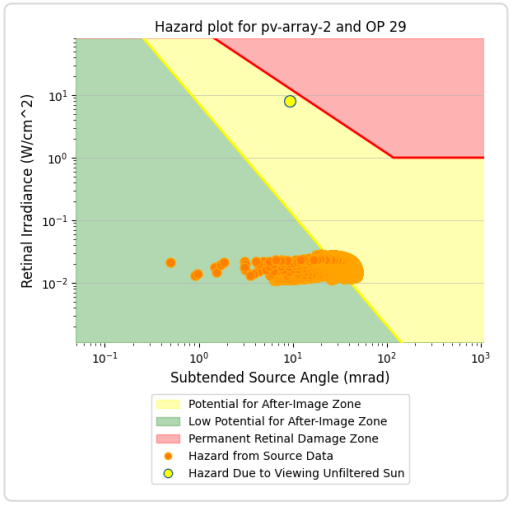
PV array 2 and OP 29

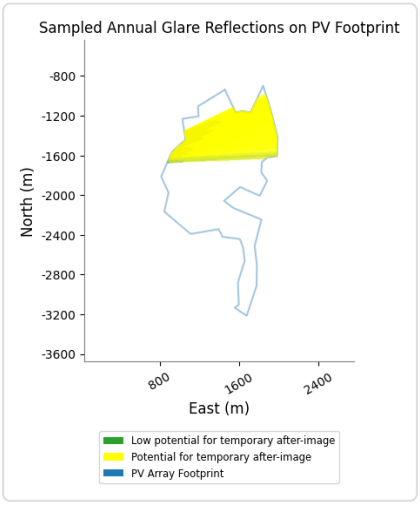
Yellow glare: 2,664 min.

Green glare: 591 min.





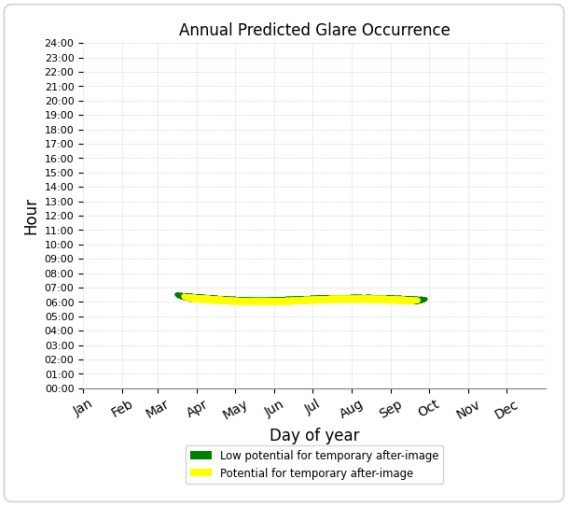


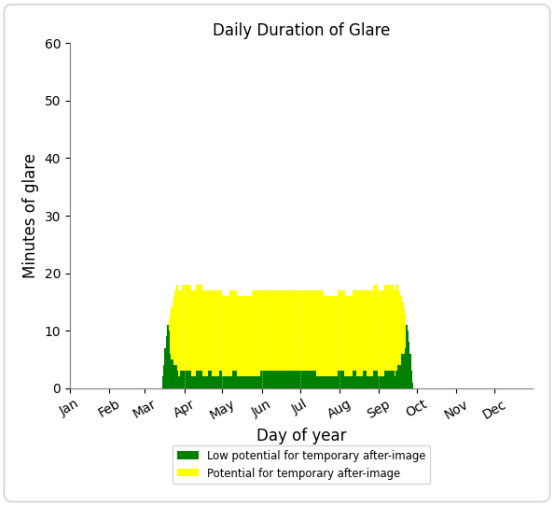


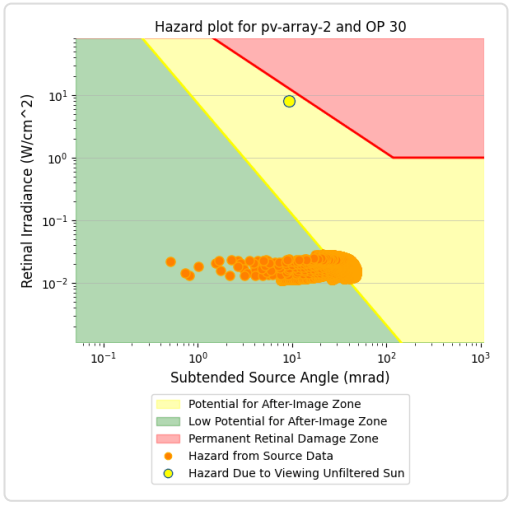
PV array 2 and OP 30

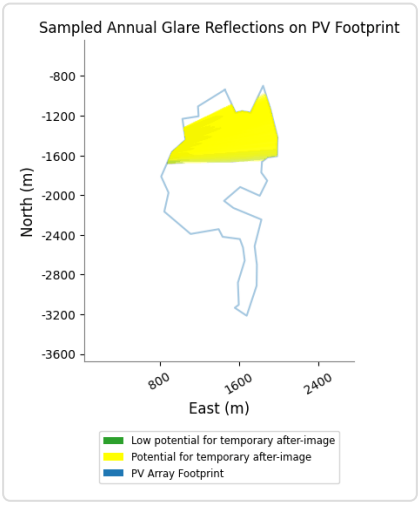
Yellow glare: 2,632 min.

Green glare: 585 min.





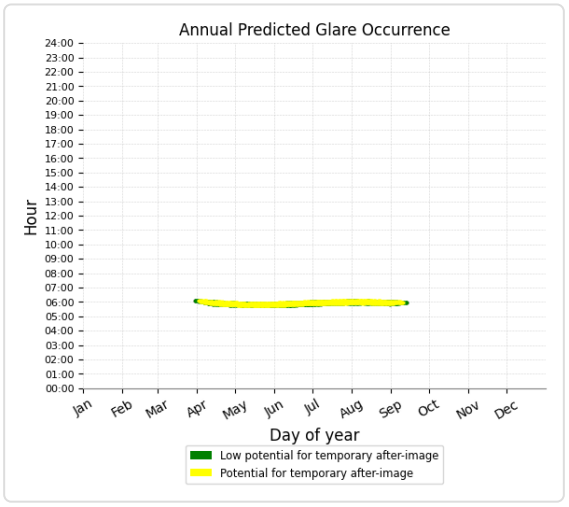


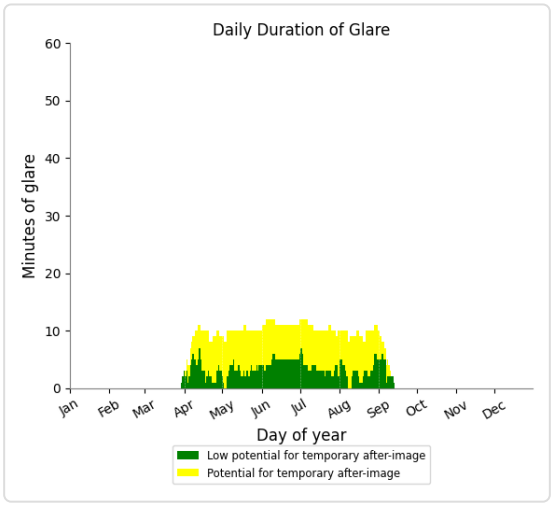


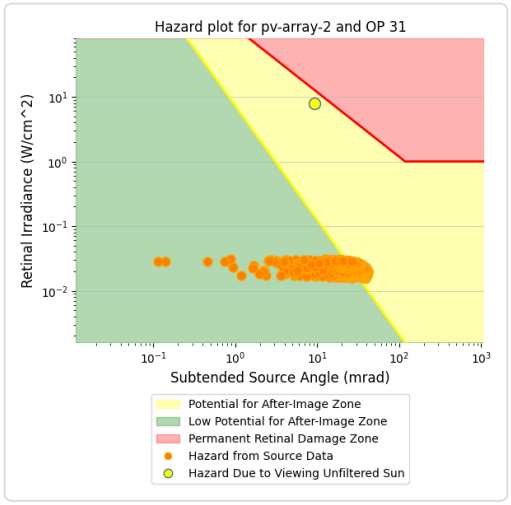
PV array 2 and OP 31

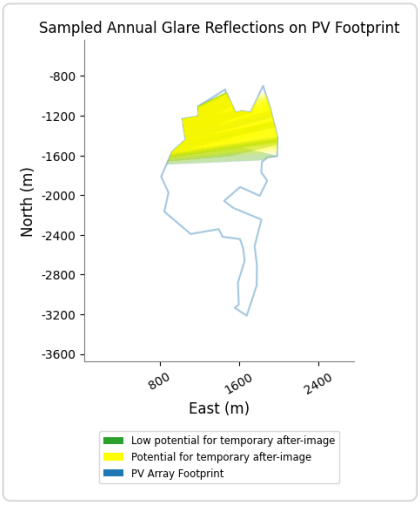
Yellow glare: 1,032 min.

Green glare: 564 min.





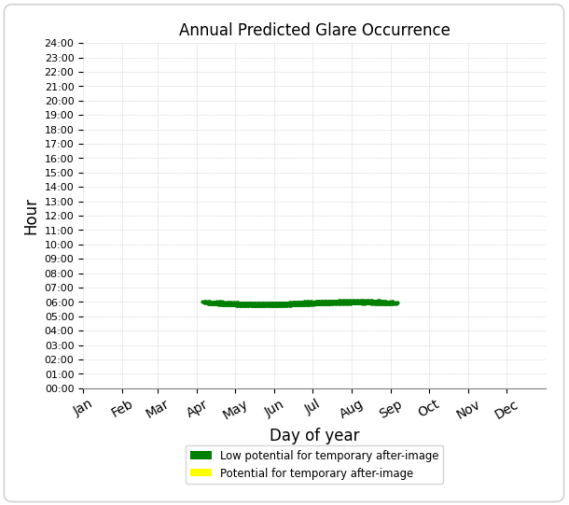


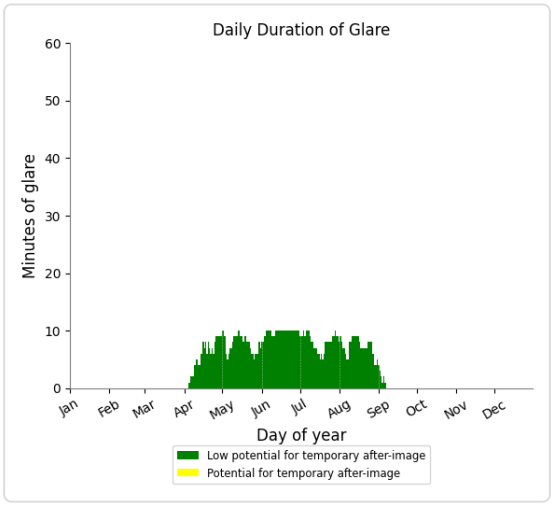


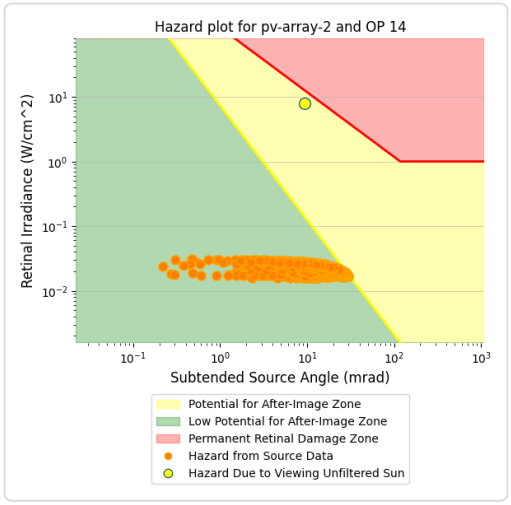
PV array 2 and OP 14

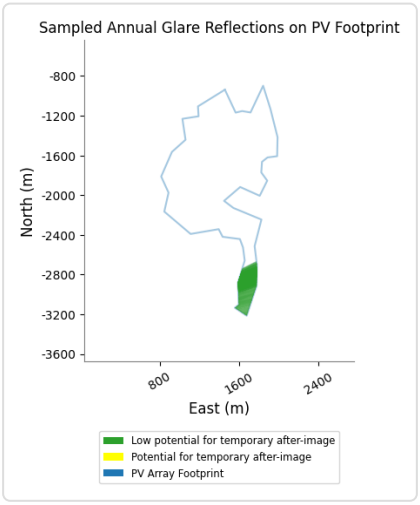
Yellow glare: none

Green glare: 1,172 min.





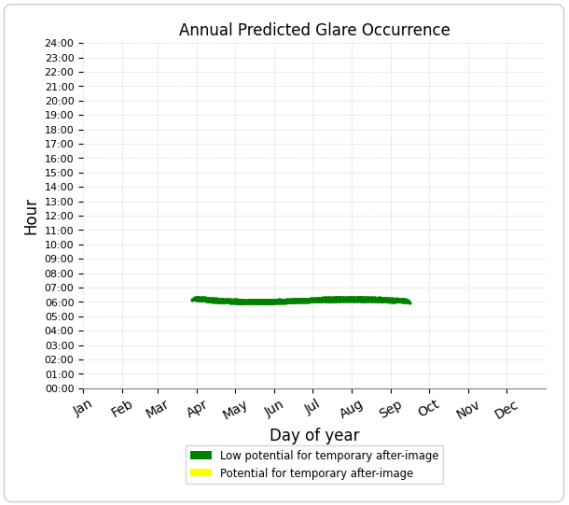


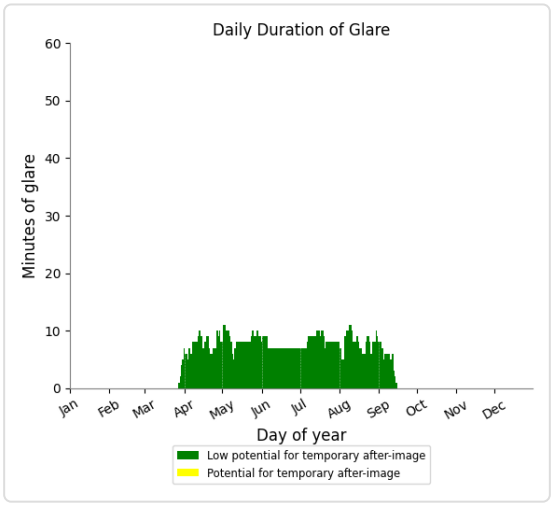


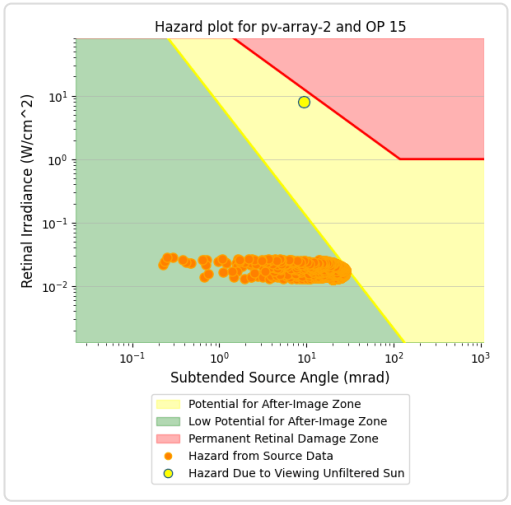
PV array 2 and OP 15

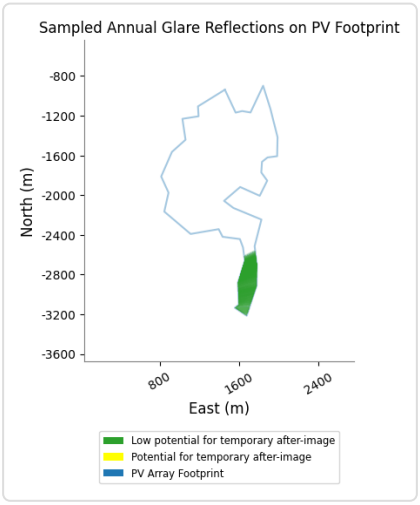
Yellow glare: none

Green glare: 1,319 min.





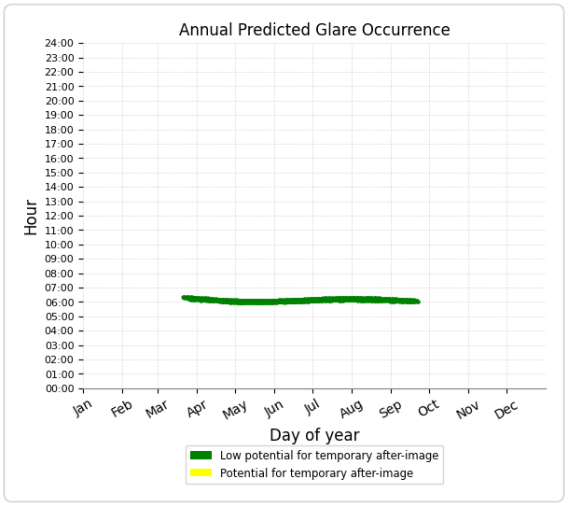


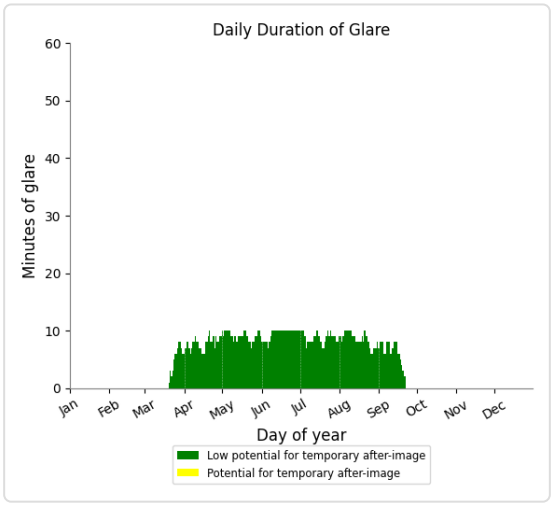


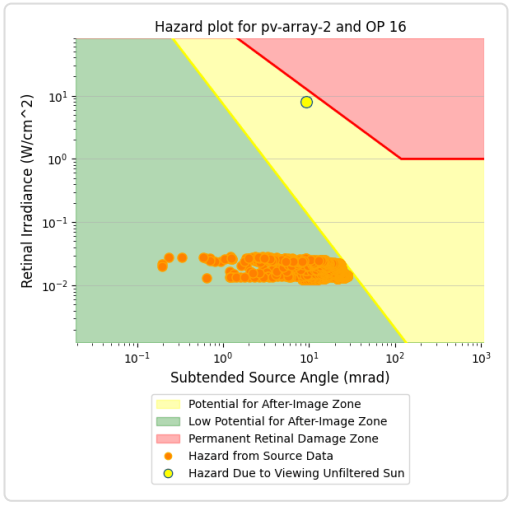
PV array 2 and OP 16

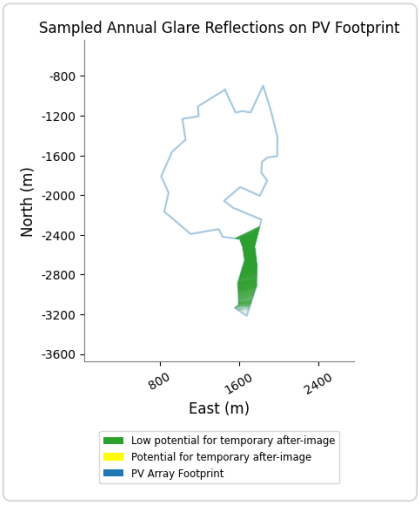
Yellow glare: none

Green glare: 1,530 min.



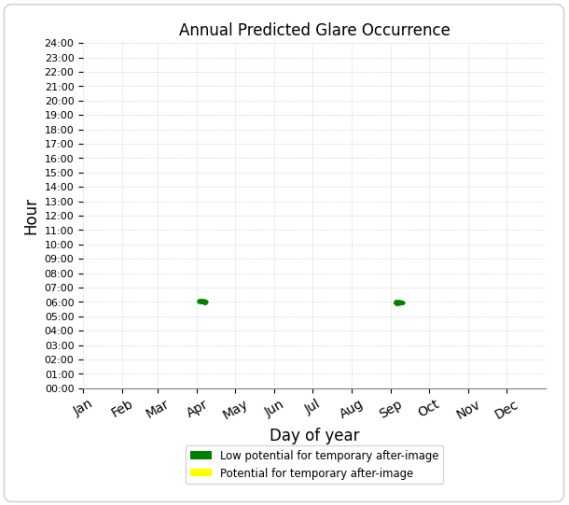


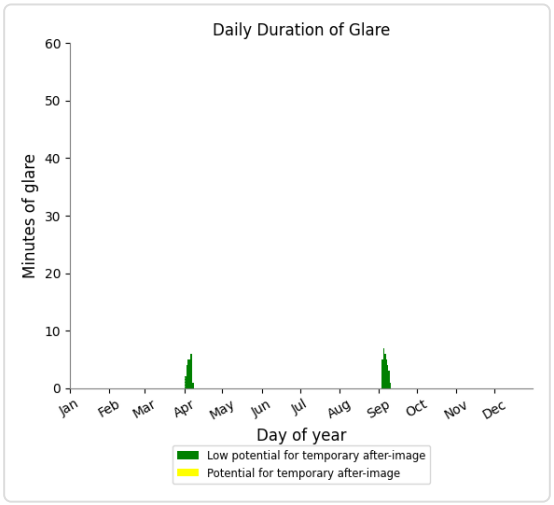


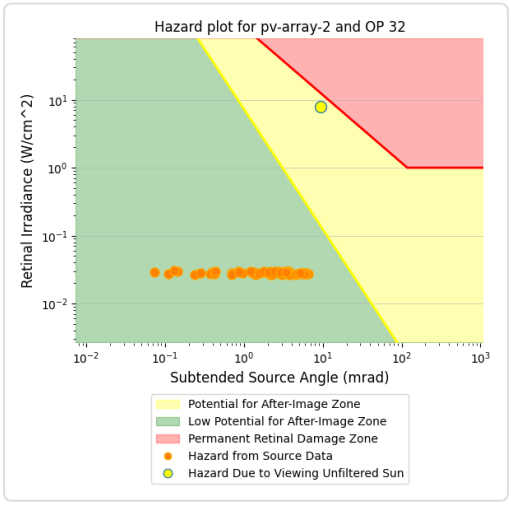


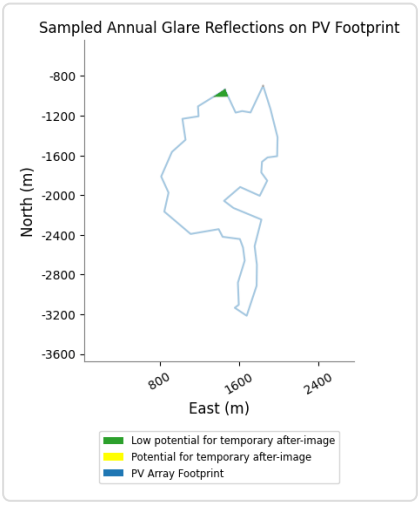
PV array 2 and OP 32

Yellow glare: none
Green glare: 60 min.









PV array 2 and OP 1

No glare found

PV array 2 and OP 10

No glare found

PV array 2 and OP 11

No glare found

PV array 2 and OP 12

No glare found

PV array 2 and OP 13

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 33

No glare found

PV array 2 and OP 34

No glare found

PV array 2 and OP 35

No glare found

PV array 2 and OP 36

No glare found

PV array 2 and OP 37

No glare found

PV: PV array 3 potential temporary after-image

Receptor results ordered by category of glare

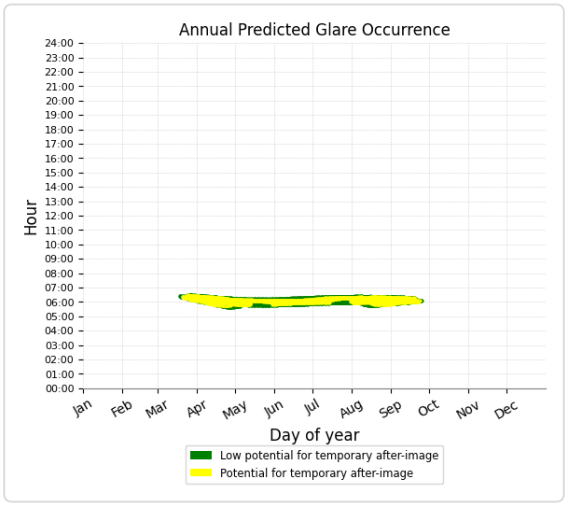
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 5C	2,676	44.6	2,397	40.0
PRoW 6C	824	13.7	8,793	146.6
PRoW 7C	191	3.2	2,110	35.2
Route 4C	724	12.1	4,351	72.5
PRoW 1C	0	0.0	0	0.0
PRoW 2C	0	0.0	0	0.0
PRoW 3C	0	0.0	0	0.0
PRoW 4C	0	0.0	0	0.0
PRoW 9C	0	0.0	0	0.0
Route 1C	0	0.0	0	0.0
Route 1C - Part 2	0	0.0	0	0.0
Route 2C	0	0.0	0	0.0
Route 3C	0	0.0	0	0.0
Route 5C	0	0.0	0	0.0
Route 6C	0	0.0	0	0.0
OP 7	1,592	26.5	468	7.8
OP 8	1,637	27.3	803	13.4
OP 9	652	10.9	1,440	24.0
OP 18	1,556	25.9	3,801	63.4
OP 19	1,954	32.6	2,592	43.2
OP 20	2,349	39.1	1,605	26.8
OP 21	917	15.3	529	8.8
OP 22	3,795	63.2	7,901	131.7
OP 10	132	2.2	0	0.0
OP 17	1,630	27.2	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

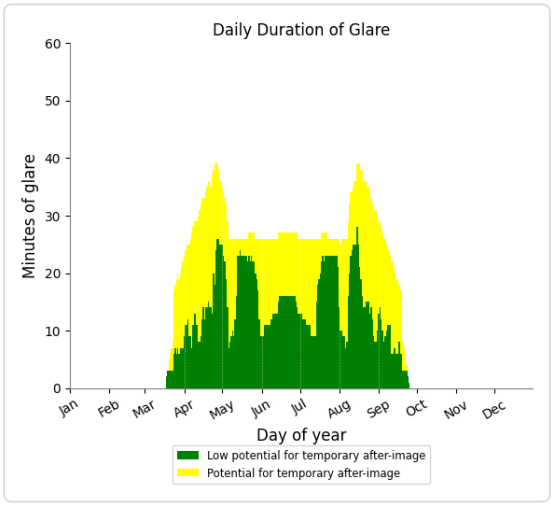
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0

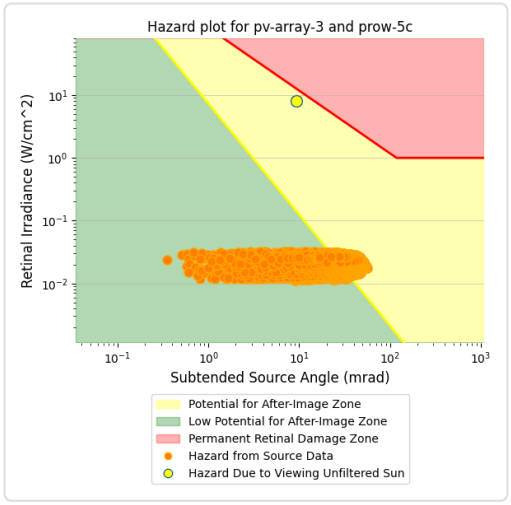
PV array 3 and Route: PRoW 5C

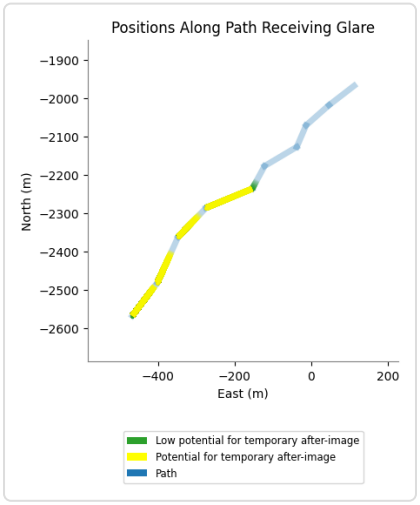
Yellow glare: 2,397 min.

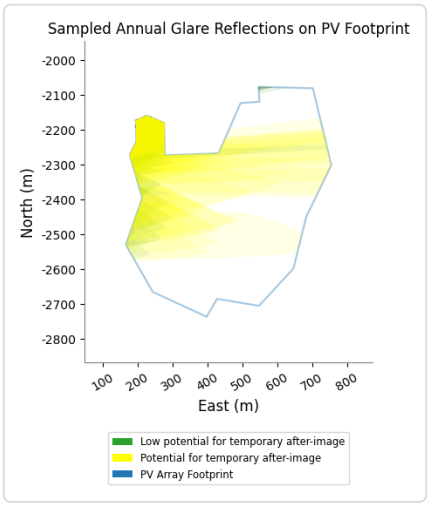
Green glare: 2,676 min.







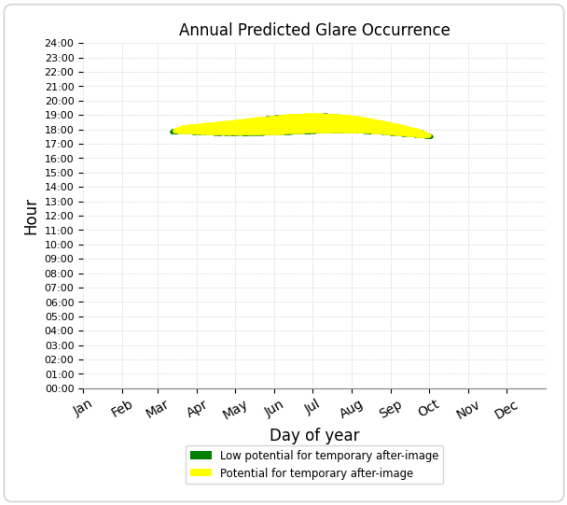


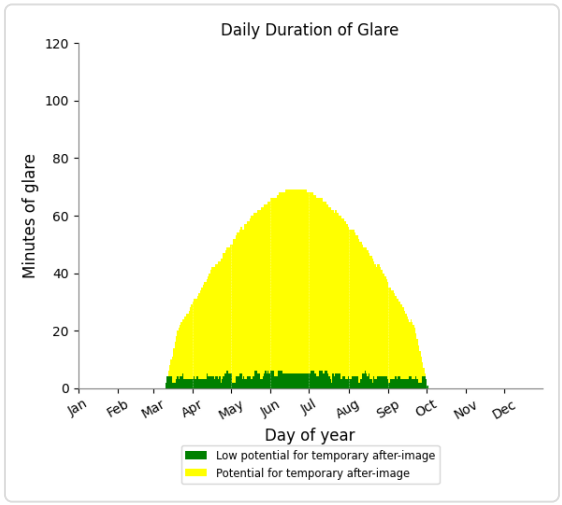


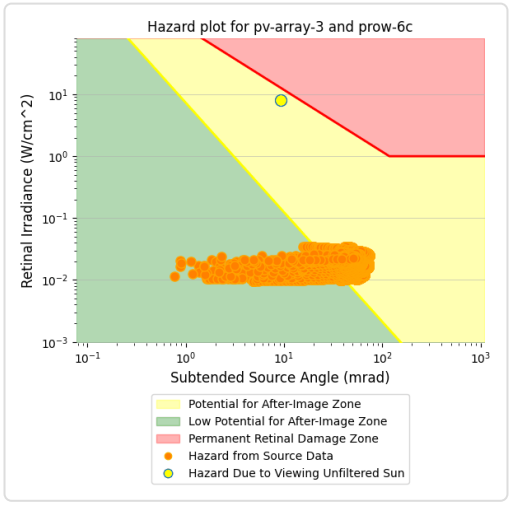
PV array 3 and Route: PRoW 6C

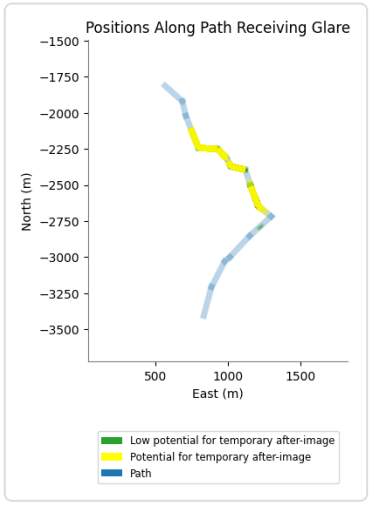
Yellow glare: 8,793 min.

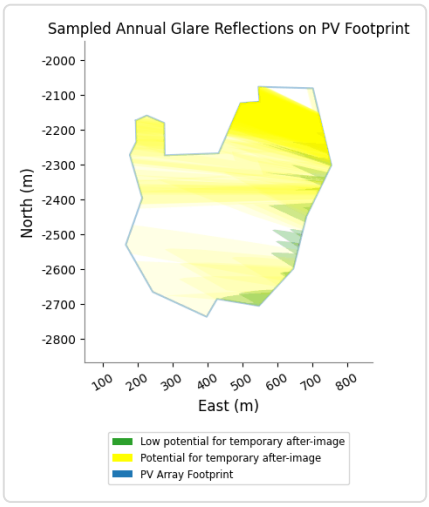
Green glare: 824 min.







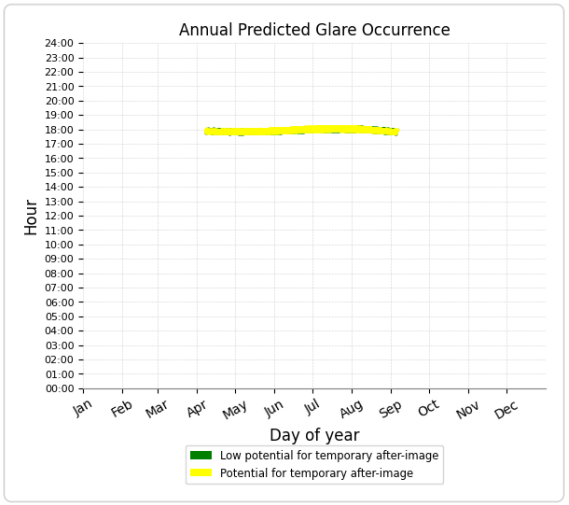


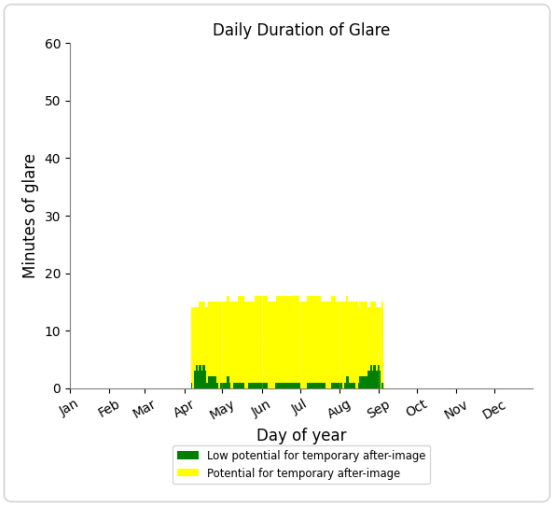


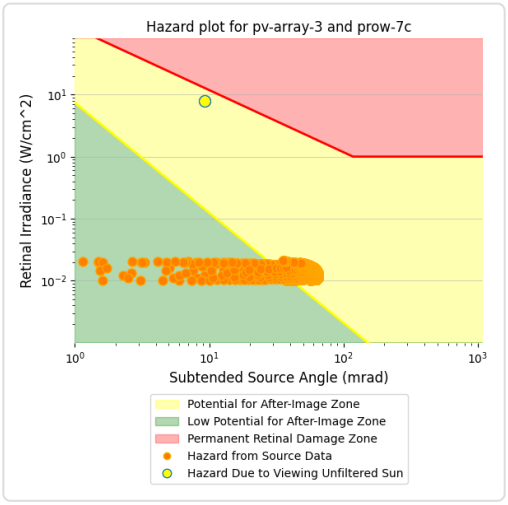
PV array 3 and Route: PRoW 7C

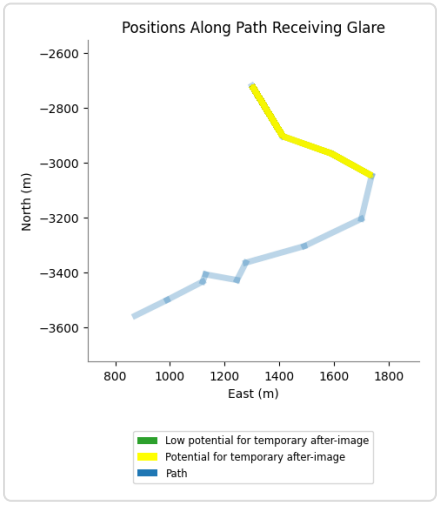
Yellow glare: 2,110 min.

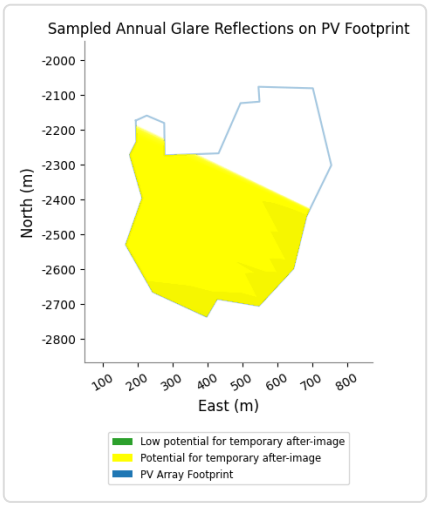
Green glare: 191 min.







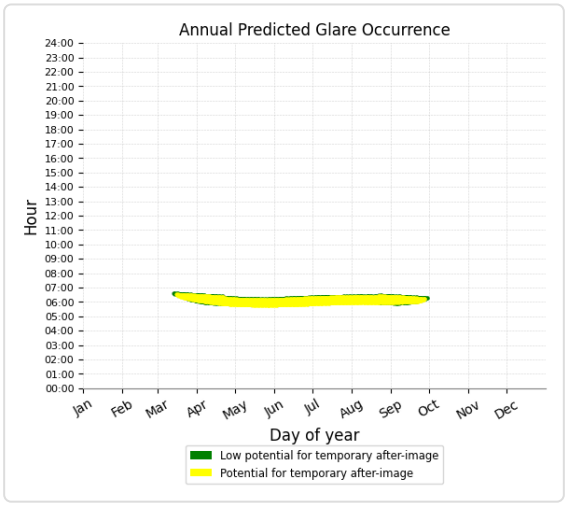


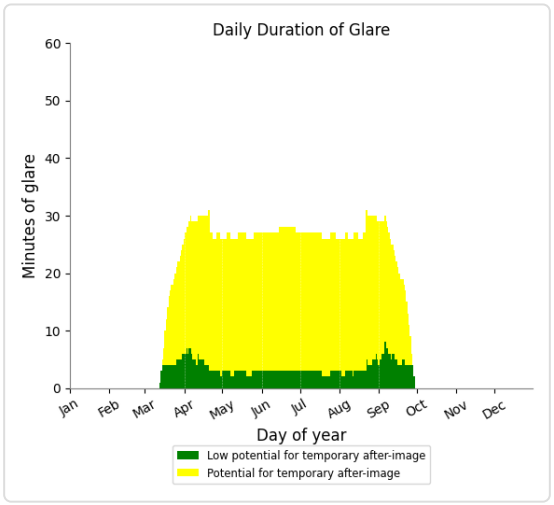


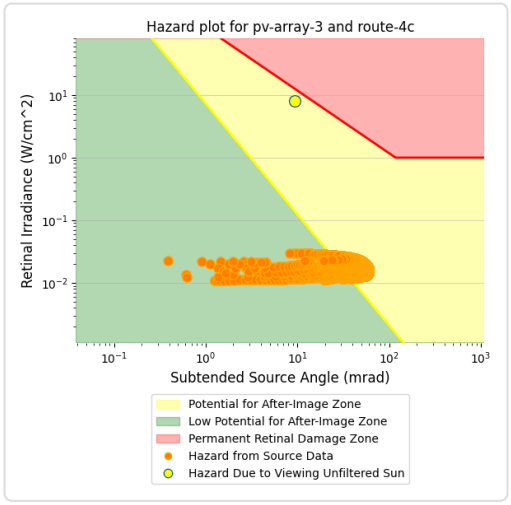
PV array 3 and Route: Route 4C

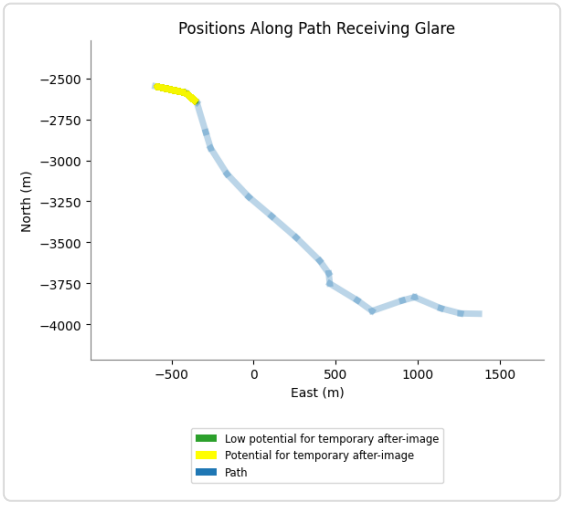
Yellow glare: 4,351 min.

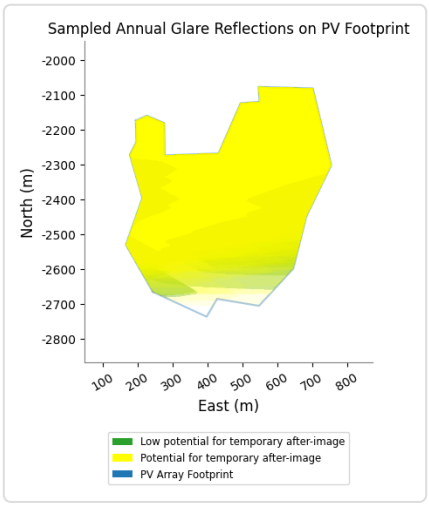
Green glare: 724 min.











PV array 3 and Route: PRoW 1C

No glare found

PV array 3 and Route: PRoW 2C

No glare found

PV array 3 and Route: PRoW 3C

No glare found

PV array 3 and Route: PRoW 4C

No glare found

PV array 3 and Route: PRoW 9C

No glare found

PV array 3 and Route: Route 1C

No glare found

PV array 3 and Route: Route 1C - Part 2

No glare found

PV array 3 and Route: Route 2C

No glare found

PV array 3 and Route: Route 3C

No glare found

PV array 3 and Route: Route 5C

No glare found

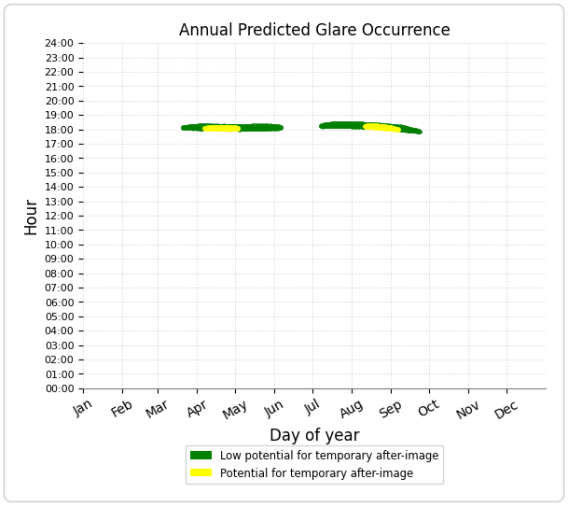
PV array 3 and Route: Route 6C

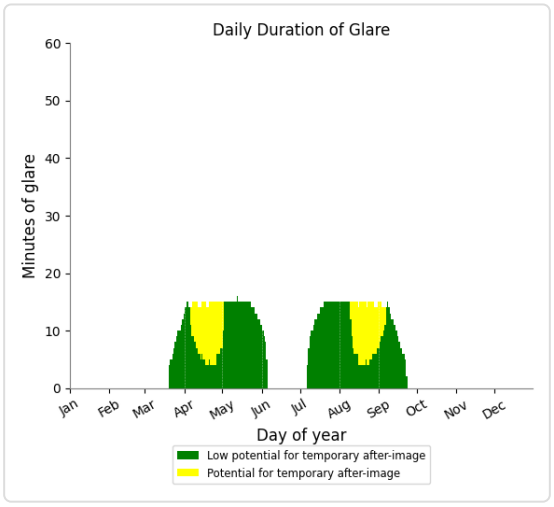
No glare found

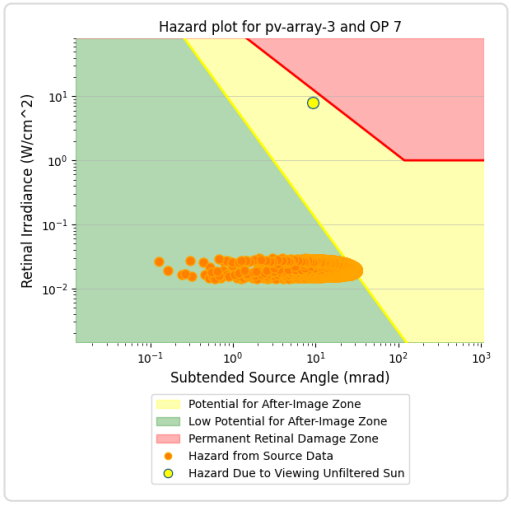
PV array 3 and OP 7

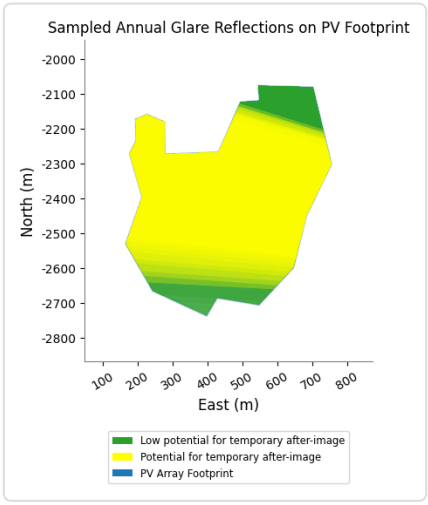
Yellow glare: 468 min.

Green glare: 1,592 min.





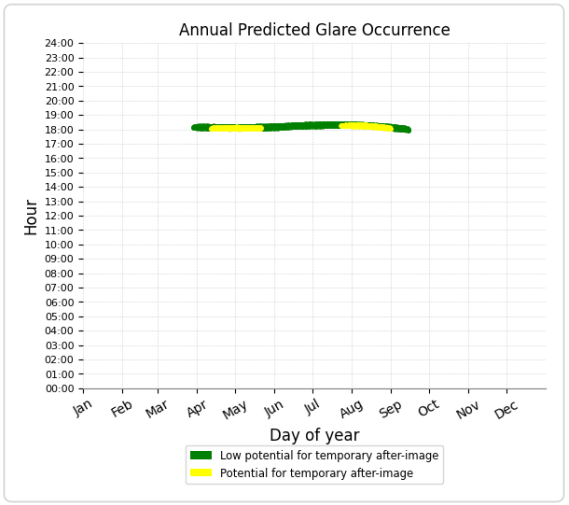


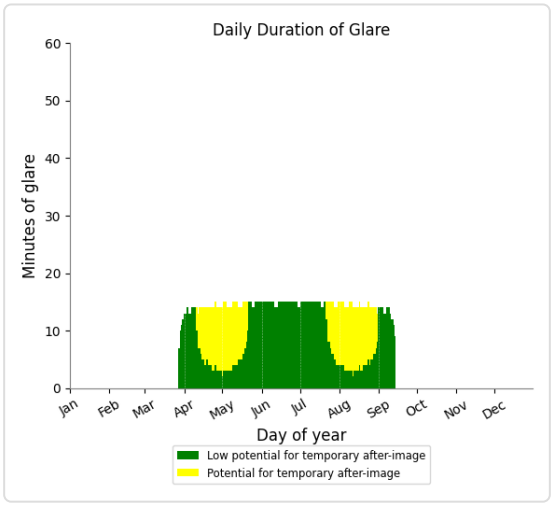


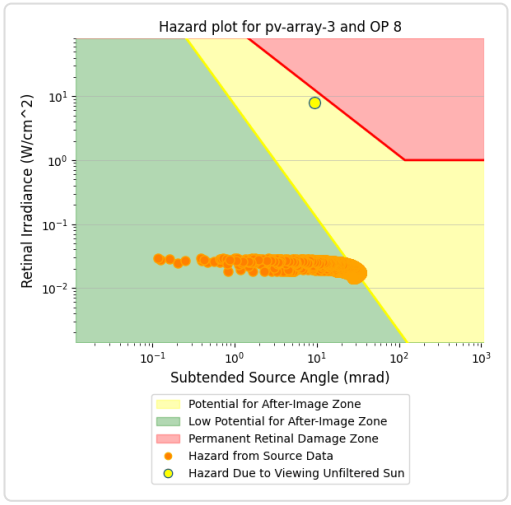
PV array 3 and OP 8

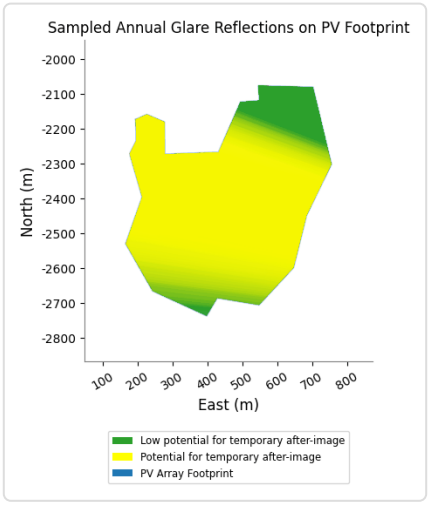
Yellow glare: 803 min.

Green glare: 1,637 min.





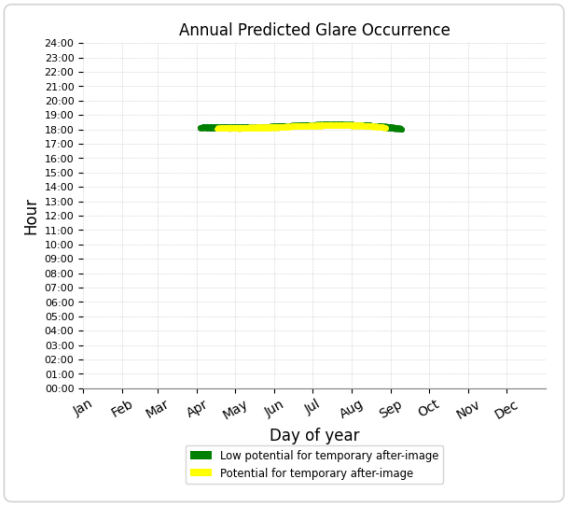


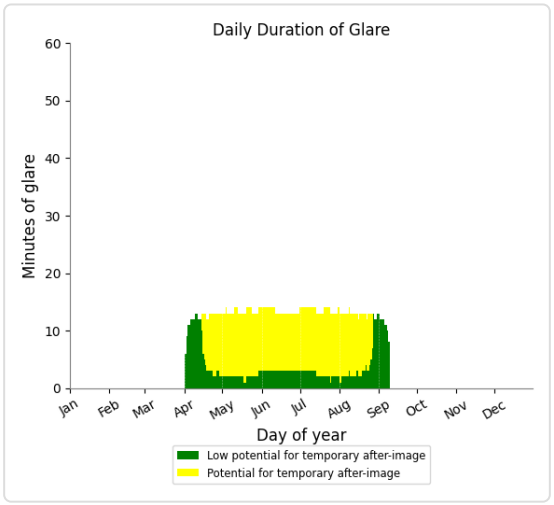


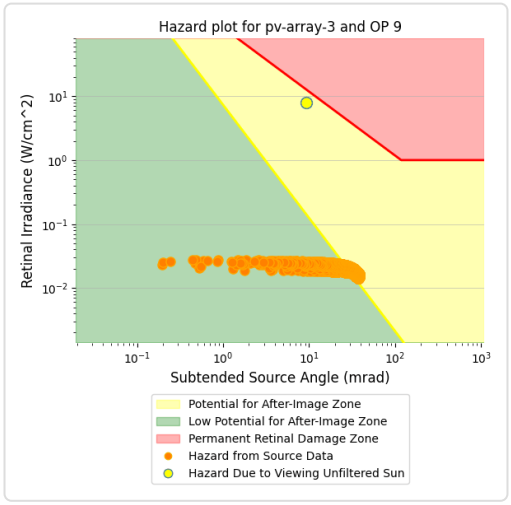
PV array 3 and OP 9

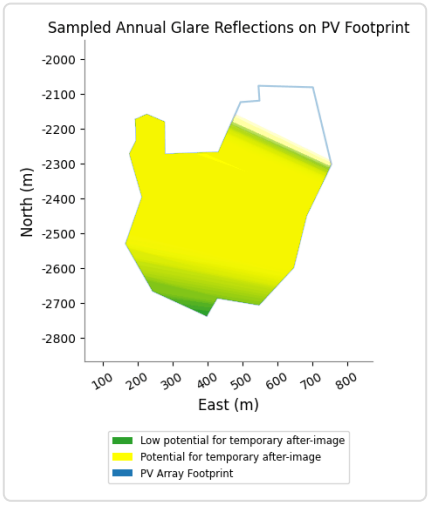
Yellow glare: 1,440 min.

Green glare: 652 min.





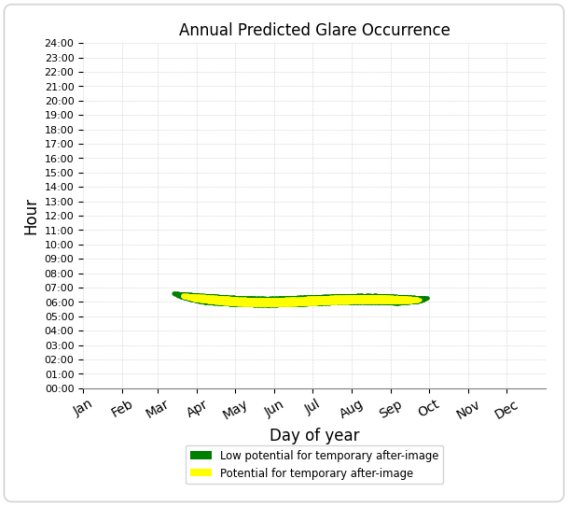


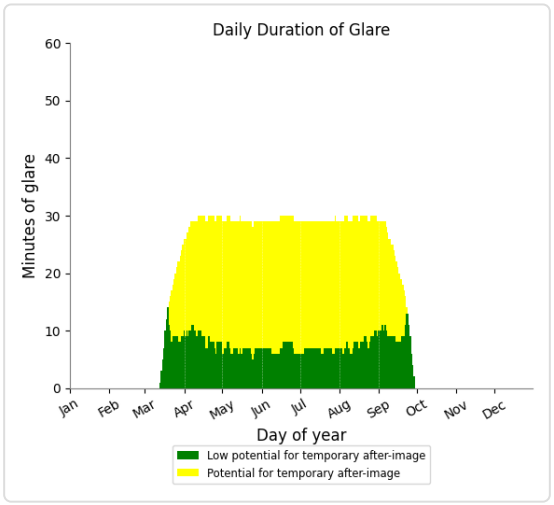


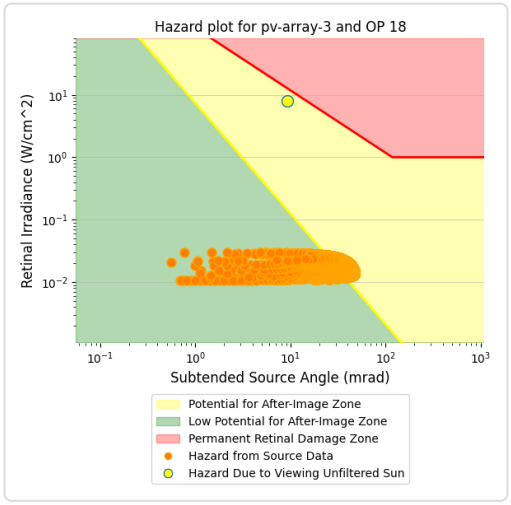
PV array 3 and OP 18

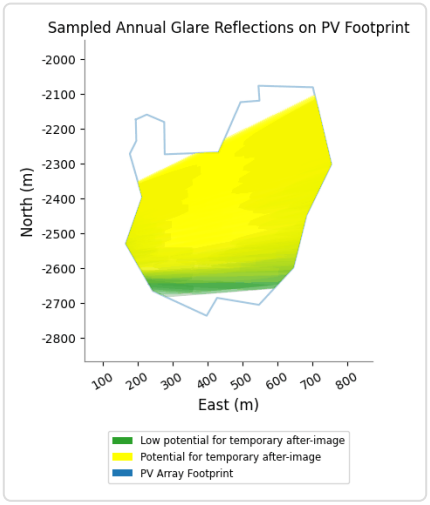
Yellow glare: 3,801 min.

Green glare: 1,556 min.





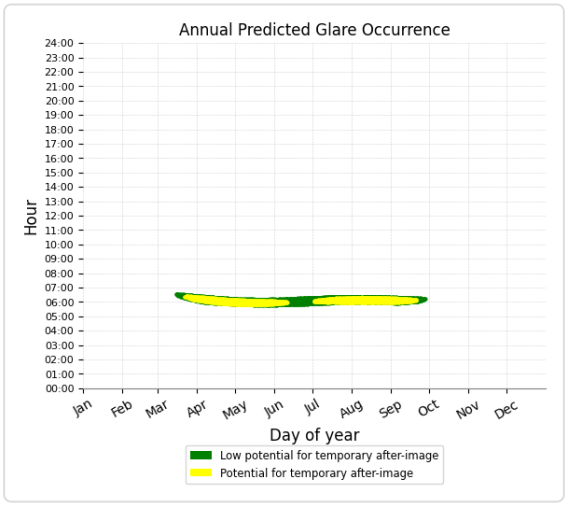


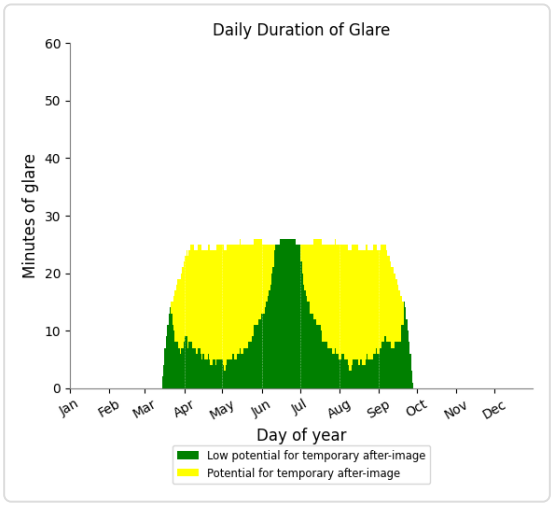


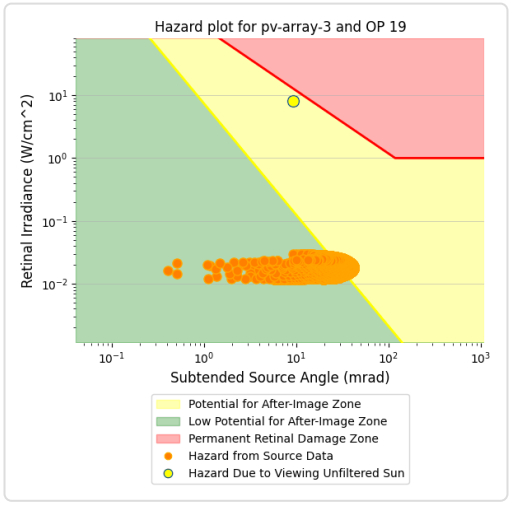
PV array 3 and OP 19

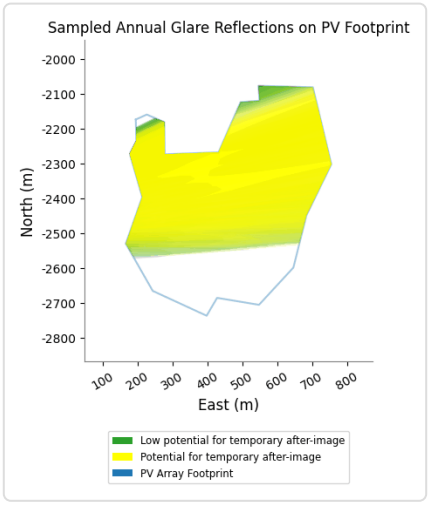
Yellow glare: 2,592 min.

Green glare: 1,954 min.





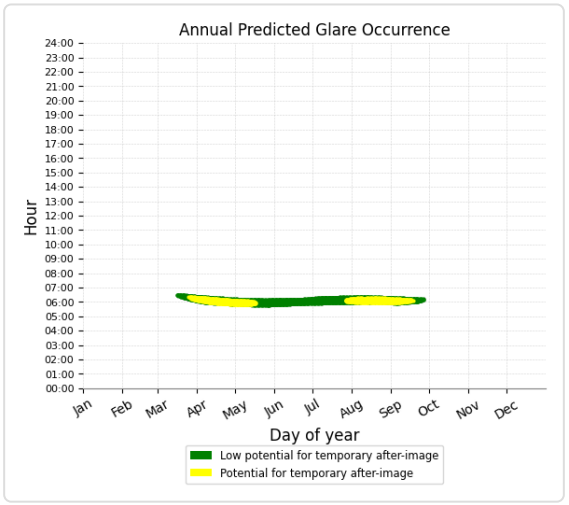


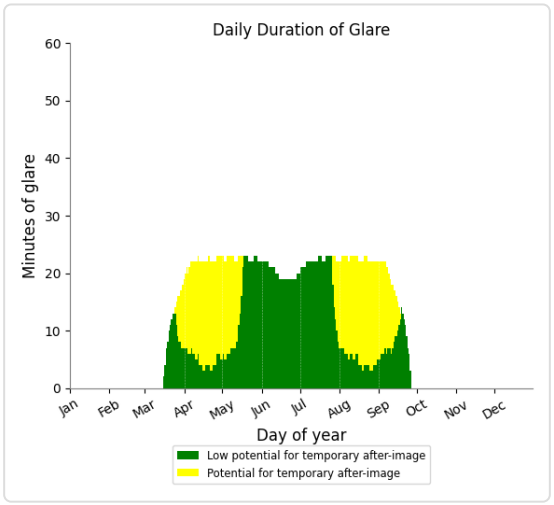


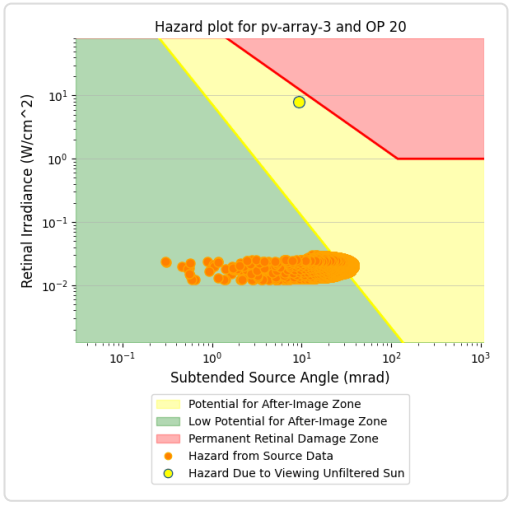
PV array 3 and OP 20

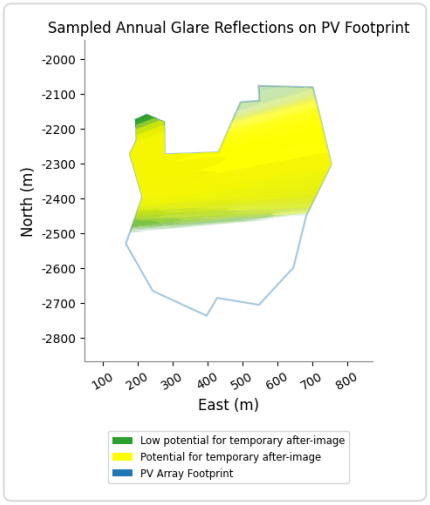
Yellow glare: 1,605 min.

Green glare: 2,349 min.





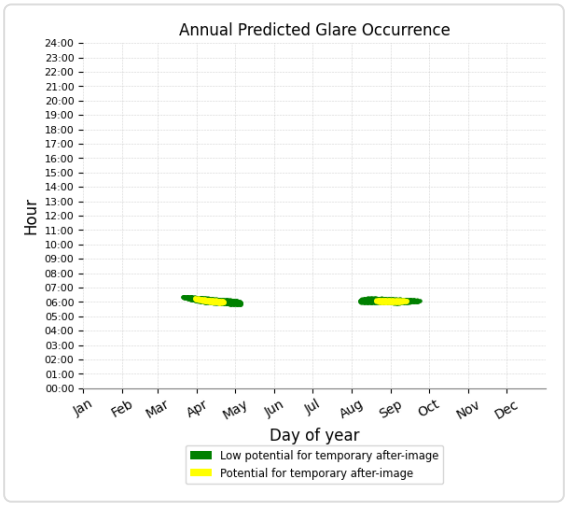


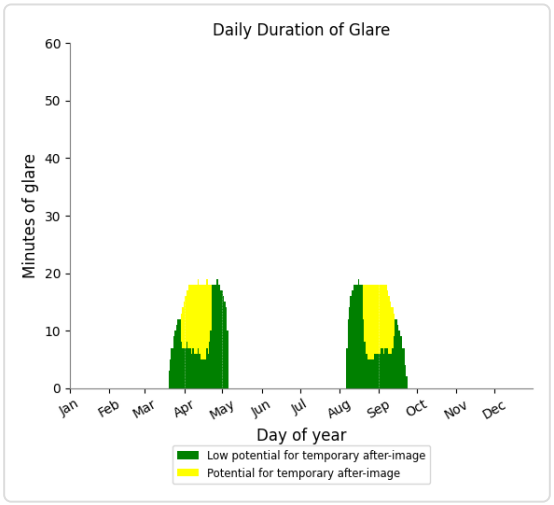


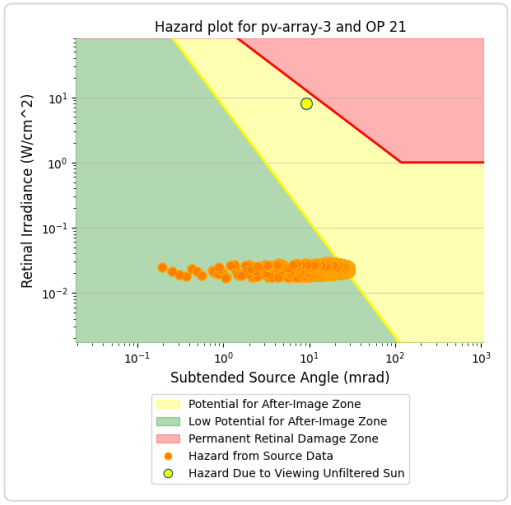
PV array 3 and OP 21

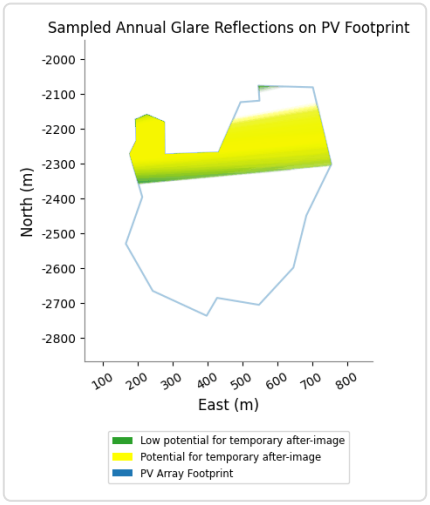
Yellow glare: 529 min.

Green glare: 917 min.





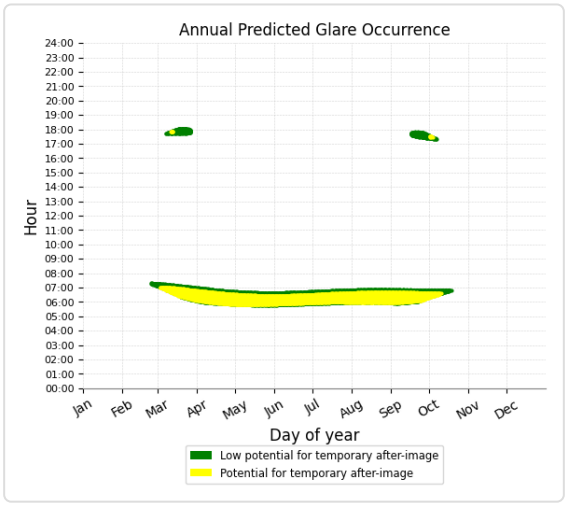


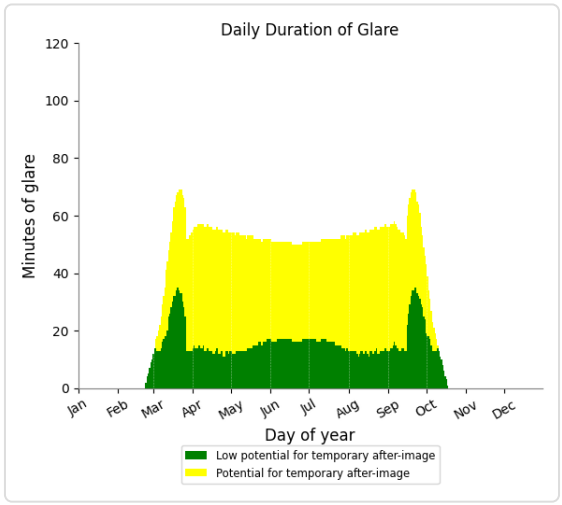


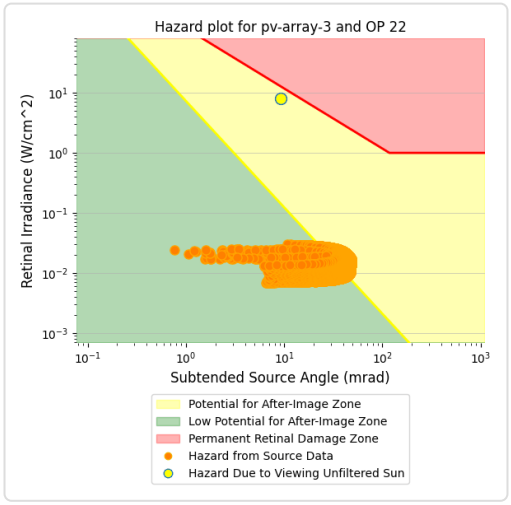
PV array 3 and OP 22

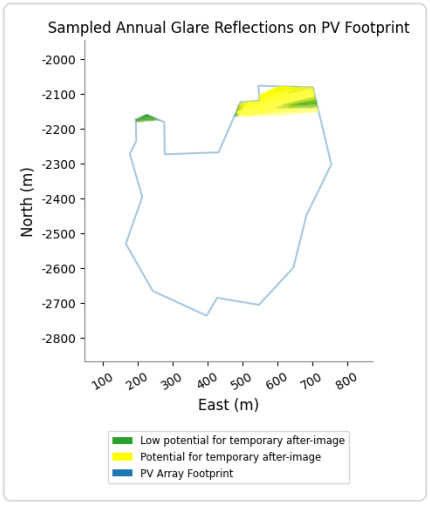
Yellow glare: 7,901 min.

Green glare: 3,795 min.





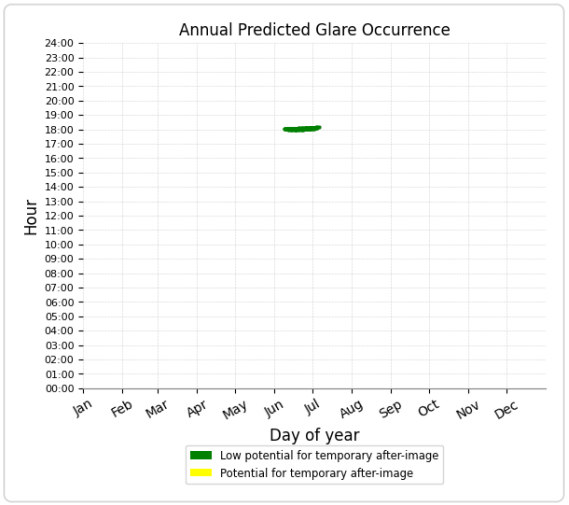


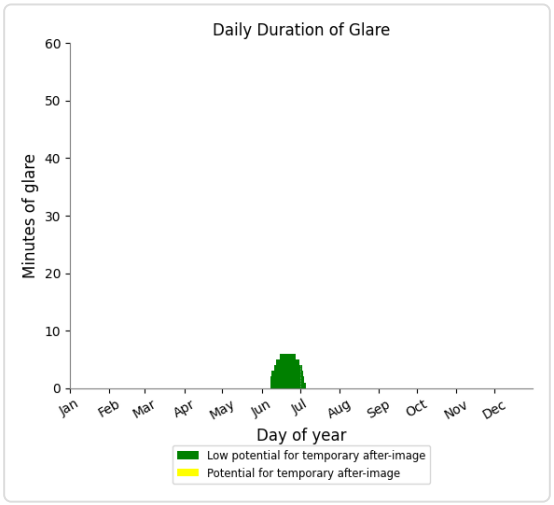


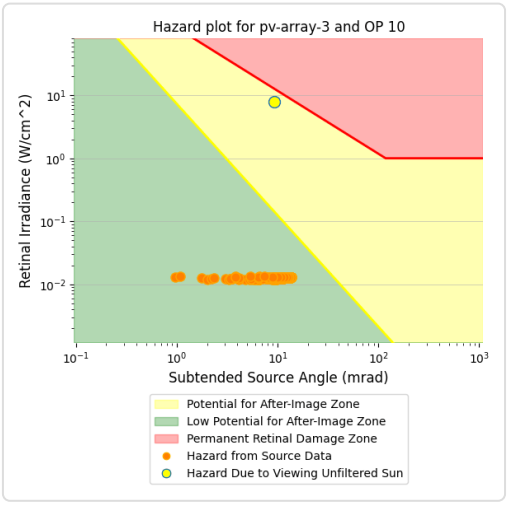
PV array 3 and OP 10

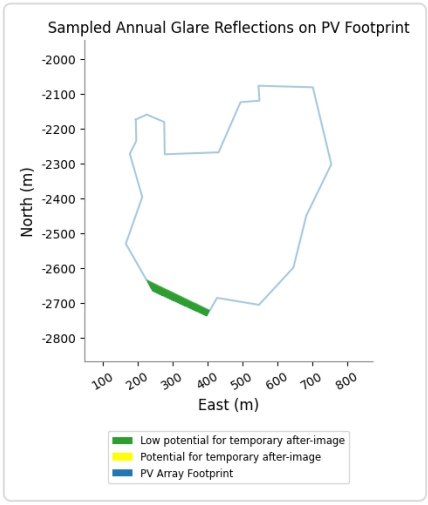
Yellow glare: none

Green glare: 132 min.





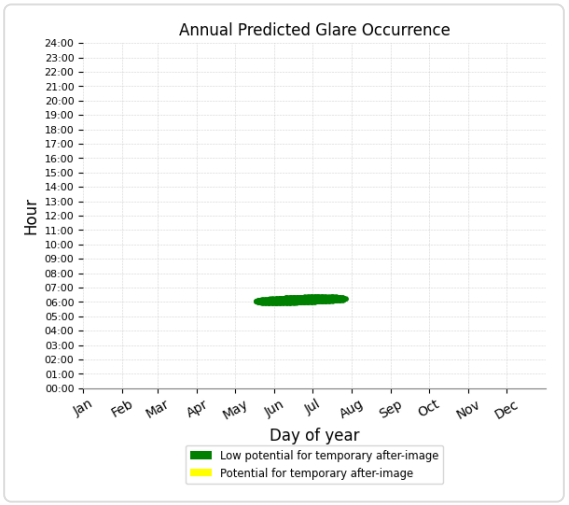


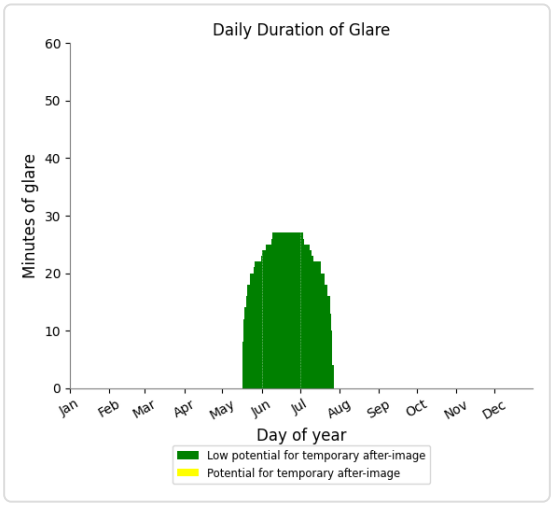


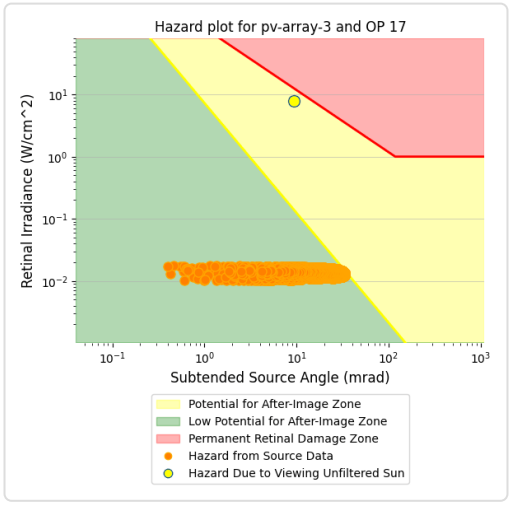
PV array 3 and OP 17

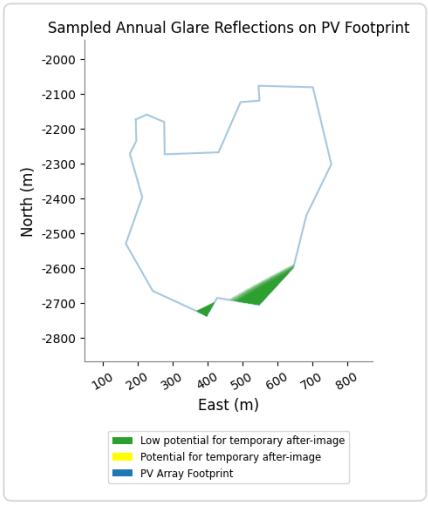
Yellow glare: none

Green glare: 1,630 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 11

No glare found

PV array 3 and OP 12

No glare found

PV array 3 and OP 13

No glare found

PV array 3 and OP 14

No glare found

PV array 3 and OP 15

No glare found

PV array 3 and OP 16

No glare found

PV array 3 and OP 23

No glare found

PV array 3 and OP 24

No glare found

PV array 3 and OP 25

No glare found

PV array 3 and OP 26

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 29

No glare found

PV array 3 and OP 30

No glare found

PV array 3 and OP 31

No glare found

PV array 3 and OP 32

No glare found

PV array 3 and OP 33

No glare found

PV array 3 and OP 34

No glare found

PV array 3 and OP 35

No glare found

PV array 3 and OP 36

No glare found

PV array 3 and OP 37

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page a[redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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W2D

W2 Area	OP No. in Glare Analysis	Residential Receptor No.
A	1	1
A	2	2
A	3	3
A	4	4
A	5	5
A	6	6
A	7	7
A	8	8
A	9	9
A	10	10
A	11	11
A	12	12
A	13	13
A	14	14
A	15	15
A	16	16
A	17	17
B	1	18
B	2	19
B	3	20
B	4	21
B	5	22
B	6	23
B	7	24
B	8	25
B	9	26
B	10	27
B	11	28
B	12	29
B	13	30
B	14	31
B	15	32
B	16	33
C	1	34
C	2	35

C	3	36
C	4	37
C	5	38
C	6	39
C	7	40
C	8	41
C	9	42
C	10	43
C	11	44
C	12	45
C	13	46
C	14	47
C	15	48
C	16	49
C	17	50
C	18	51
C	19	52
C	20	53
C	21	22
C	22	54
C	23	55
C	24	56
C	25	57
C	26	58
C	27	59
C	28	60
C	29	61
C	30	62
C	31	21
C	32	20
C	33	19
C	34	63
C	35	18
C	36	64
C	37	65
D	1	66
D	2	67
D	3	68
D	4	69
D	5	70
D	6	71

D	7	72
D	8	73
D	9	74
D	10	75
D	11	76
D	12	77
D	13	78
D	14	79
D	15	80
D	16	81
D	17	82
D	18	83
D	19	84
D	20	43
D	21	42
D	22	85
D	23	41
D	24	40
D	25	86
D	26	37
D	27	39
D	28	38
D	29	36
D	30	35
E	1	87
E	2	88
E	3	89
E	4	90
E	5	91
E	6	92
E	7	93
E	8	94
E	9	95
E	10	96
E	11	97
E	12	98
E	13	99
E	14	100
E	15	101
E	16	102
E	17	103

E	18	104
E	19	105
E	20	106
E	21	107
E	22	82
E	23	81
E	24	79
E	25	78
E	26	80
E	27	77
E	28	76
E	29	75

FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **W2D-temp-9**

Created 03 Jul, 2025
Updated 03 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153885.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	10,899	181.7	2,747	45.8	-
PV array 2	8.0	180.0	95,013	1,583.5	101,341	1,689.0	-
PV array 3	8.0	180.0	15,543	259.1	19,527	325.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1D	601	10.0	3,239	54.0
PRoW 2D	74,834	1,247.2	79,057	1,317.6
PRoW 3D	1,447	24.1	4,948	82.5
PRoW 4D	0	0.0	0	0.0
Route 1D	65	1.1	1,572	26.2
Route 2D	100	1.7	1,869	31.1
Route 3D	2,162	36.0	710	11.8
Route 4D	2,204	36.7	851	14.2
Route 5D	963	16.1	2,128	35.5
Route 6D	0	0.0	0	0.0
OP 1	1,971	32.9	612	10.2
OP 2	1,712	28.5	270	4.5
OP 3	574	9.6	0	0.0
OP 4	1,025	17.1	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 5	1,842	30.7	325	5.4
OP 6	1,799	30.0	596	9.9
OP 7	2,357	39.3	1,273	21.2
OP 8	2,539	42.3	258	4.3
OP 9	2,371	39.5	866	14.4
OP 10	1,026	17.1	1,885	31.4
OP 11	0	0.0	0	0.0
OP 12	929	15.5	395	6.6
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	821	13.7	1,359	22.6
OP 19	1,586	26.4	4,268	71.1
OP 20	1,192	19.9	1,944	32.4
OP 21	894	14.9	129	2.1
OP 22	1,604	26.7	146	2.4
OP 23	1,506	25.1	689	11.5
OP 24	3,280	54.7	463	7.7
OP 25	1,797	29.9	2,067	34.5
OP 26	3,219	53.6	6,867	114.5
OP 27	1,182	19.7	890	14.8
OP 28	1,130	18.8	897	14.9
OP 29	1,404	23.4	2,577	43.0
OP 30	1,319	22.0	465	7.8

Component Data

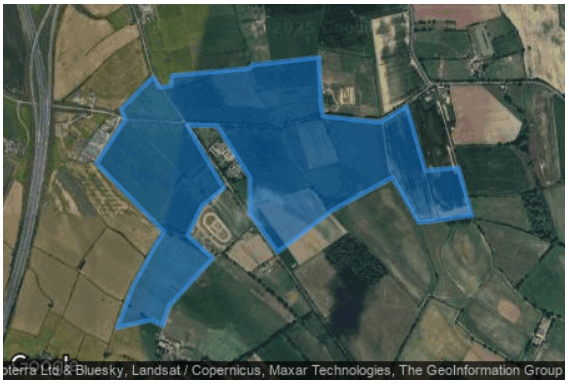
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



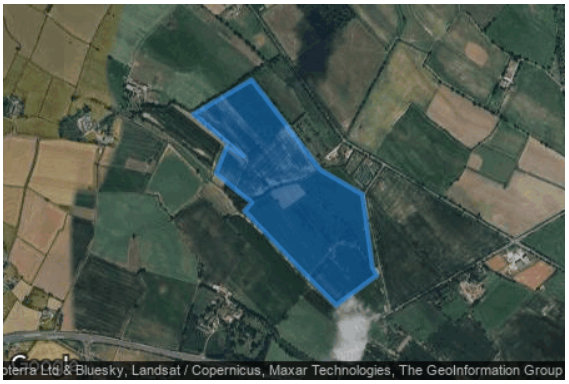
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.383281	-1.277395	113.80	3.80	117.60
2	53.383230	-1.276751	112.90	3.80	116.70
3	53.383819	-1.275463	113.00	3.80	116.80
4	53.384459	-1.275292	114.10	3.80	117.90
5	53.384523	-1.275549	113.90	3.80	117.70
6	53.385124	-1.275163	117.90	3.80	121.70
7	53.386046	-1.273103	115.10	3.80	118.90
8	53.386570	-1.273811	113.50	3.80	117.30
9	53.386481	-1.274691	113.60	3.80	117.40
10	53.387159	-1.276343	111.00	3.80	114.80
11	53.386071	-1.277030	114.90	3.80	118.70
12	53.385227	-1.277287	117.20	3.80	121.00

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382901	-1.272780	111.42	3.80	115.22
2	53.384091	-1.270806	114.08	3.80	117.88
3	53.384207	-1.270549	114.96	3.80	118.76
4	53.383797	-1.270141	112.70	3.80	116.50
5	53.383861	-1.269347	112.03	3.80	115.83
6	53.384271	-1.269283	114.04	3.80	117.84
7	53.384565	-1.263940	109.02	3.80	112.82
8	53.384693	-1.263790	109.50	3.80	113.30
9	53.385013	-1.259176	106.02	3.80	109.82
10	53.383080	-1.259026	102.82	3.80	106.62
11	53.382607	-1.258876	105.60	3.80	109.40
12	53.382365	-1.254968	100.44	3.80	104.24
13	53.383018	-1.253144	106.00	3.80	109.80
14	53.380394	-1.251878	101.04	3.80	104.84
15	53.380509	-1.249603	102.09	3.80	105.89
16	53.378551	-1.248659	100.79	3.80	104.59
17	53.378256	-1.252307	98.79	3.80	102.59
18	53.380112	-1.254131	100.47	3.80	104.27
19	53.378768	-1.258229	105.86	3.80	109.66
20	53.377053	-1.262008	102.04	3.80	105.84
21	53.378665	-1.263939	105.01	3.80	108.81
22	53.380112	-1.263939	110.51	3.80	114.31
23	53.382224	-1.266192	109.63	3.80	113.43
24	53.382236	-1.268223	110.90	3.80	114.70
25	53.379677	-1.265713	106.89	3.80	110.69
26	53.378915	-1.267247	105.15	0.00	105.15
27	53.377744	-1.268180	103.85	3.80	107.65
28	53.376809	-1.266464	99.36	3.80	103.16
29	53.374864	-1.269468	111.80	3.80	115.60
30	53.374435	-1.269693	112.98	3.80	116.78
31	53.374057	-1.269918	112.03	3.80	115.83
32	53.374281	-1.270734	113.69	3.80	117.49
33	53.373967	-1.273051	117.72	3.80	121.52
34	53.375670	-1.271968	116.93	3.80	120.73
35	53.377373	-1.270390	104.13	3.80	107.93
36	53.377897	-1.269854	103.35	3.80	107.15
37	53.380688	-1.274489	108.43	3.80	112.23
38	53.382473	-1.272515	111.56	3.80	115.36

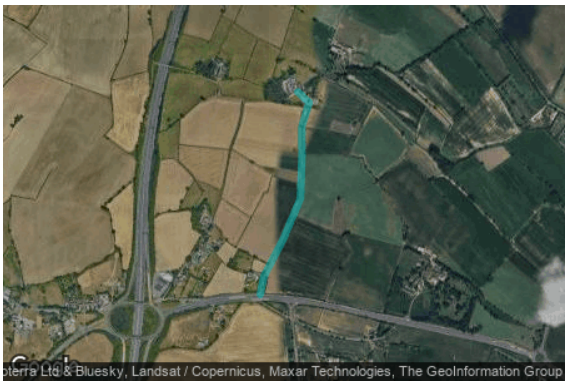
Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.364385	-1.255756	96.26	3.80	100.06
2	53.365599	-1.252975	98.15	3.80	101.95
3	53.365947	-1.253267	96.51	3.80	100.31
4	53.368917	-1.253954	97.15	3.80	100.95
5	53.369916	-1.256829	96.24	3.80	100.04
6	53.373603	-1.261561	98.84	3.80	102.64
7	53.372188	-1.265584	105.90	3.80	109.70
8	53.370498	-1.262161	99.17	3.80	102.97
9	53.370940	-1.263245	101.66	3.80	105.46
10	53.369775	-1.264028	99.03	3.80	102.83
11	53.369045	-1.262548	97.83	3.80	101.63
12	53.368584	-1.261550	98.81	3.80	102.61
13	53.368245	-1.262065	98.03	3.80	101.83
14	53.365870	-1.258245	99.59	3.80	103.39
15	53.365588	-1.257773	99.82	3.80	103.62

Route Receptors

Name: PRoW 1D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.363281	-1.275051	117.67	2.75	120.42
2	53.364002	-1.274820	118.86	2.75	121.61
3	53.365618	-1.273415	115.44	2.75	118.19
4	53.367206	-1.272299	110.55	2.75	113.30
5	53.368947	-1.272192	114.22	2.75	116.97
6	53.370163	-1.272192	111.27	2.75	114.02
7	53.371123	-1.271698	110.52	2.75	113.27
8	53.371559	-1.272471	110.44	2.75	113.19

Name: PRoW 2D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381921	-1.267911	111.51	2.75	114.26
2	53.380898	-1.269820	109.56	2.75	112.31
3	53.379733	-1.271505	110.14	2.75	112.89
4	53.378363	-1.273264	107.69	2.75	110.44
5	53.376981	-1.275045	114.70	2.75	117.45
6	53.375304	-1.276140	116.00	2.75	118.75
7	53.373717	-1.277448	114.32	2.75	117.07
8	53.372104	-1.278350	109.72	2.75	112.47
9	53.372001	-1.277899	108.96	2.75	111.71
10	53.371399	-1.278157	110.49	2.75	113.24
11	53.369953	-1.281504	112.57	2.75	115.32
12	53.368544	-1.280581	116.49	2.75	119.24
13	53.367955	-1.279444	115.14	2.75	117.89
14	53.366470	-1.278414	119.13	2.75	121.88

Name: PRoW 3D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.372392	-1.268071	109.27	2.75	112.02
2	53.374005	-1.266730	107.26	2.75	110.01
3	53.374529	-1.264627	100.70	2.75	103.45
4	53.375521	-1.262643	98.61	2.75	101.36
5	53.376533	-1.260186	98.22	2.75	100.97
6	53.377800	-1.256935	102.76	2.75	105.51
7	53.379362	-1.256227	102.64	2.75	105.39
8	53.381090	-1.255497	100.07	2.75	102.82
9	53.382459	-1.254746	101.26	2.75	104.01

Name: PRoW 4D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.363409	-1.253990	95.74	2.75	98.49
2	53.362705	-1.256833	100.85	2.75	103.60
3	53.361988	-1.259515	110.61	2.75	113.36
4	53.361663	-1.260484	111.21	2.75	113.96
5	53.361343	-1.260543	112.09	2.75	114.84
6	53.359602	-1.260157	118.34	2.75	121.09
7	53.358683	-1.260216	118.61	2.75	121.36
8	53.357722	-1.258843	117.43	2.75	120.18
9	53.357495	-1.258534	118.60	2.75	121.35
10	53.357418	-1.257855	117.06	2.75	119.81

Name: Route 1D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.390918	-1.281780	96.11	1.50	97.61
2	53.389268	-1.280621	103.30	1.50	104.80
3	53.387591	-1.279784	108.30	1.50	109.80
4	53.385838	-1.278819	111.22	1.50	112.72
5	53.384008	-1.278218	110.96	1.50	112.46
6	53.382254	-1.278132	114.27	1.50	115.77
7	53.380488	-1.278452	114.23	1.50	115.73
8	53.378735	-1.278881	112.27	1.50	113.77
9	53.376994	-1.279504	111.35	1.50	112.85
10	53.375214	-1.280276	110.54	1.50	112.04
11	53.373461	-1.281220	109.22	1.50	110.72
12	53.371720	-1.281907	109.06	1.50	110.56
13	53.369927	-1.282508	108.71	1.50	110.21
14	53.368084	-1.282894	106.49	1.50	107.99
15	53.366266	-1.283216	103.18	1.50	104.68

Name: Route 2D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.392531	-1.273227	113.52	1.50	115.02
2	53.390765	-1.274471	115.58	1.50	117.08
3	53.389383	-1.275759	114.68	1.50	116.18
4	53.387681	-1.276769	117.35	1.50	118.85
5	53.385940	-1.277478	118.56	1.50	120.06
6	53.384142	-1.277617	114.25	1.50	115.75
7	53.383067	-1.277703	113.42	1.50	114.92

Name: Route 3D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.387005	-1.252769	107.15	1.50	108.65
2	53.385188	-1.252747	108.53	1.50	110.03
3	53.383870	-1.251546	108.99	1.50	110.49
4	53.383895	-1.248585	105.32	1.50	106.82
5	53.383929	-1.245512	103.38	1.50	104.88
6	53.383987	-1.244074	104.22	1.50	105.72
7	53.383020	-1.241617	104.63	1.50	106.13
8	53.382037	-1.239276	109.66	1.50	111.16
9	53.380974	-1.236829	107.94	1.50	109.44
10	53.379906	-1.234415	105.13	1.50	106.63

Name: Route 4D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.363141	-1.274852	116.78	1.50	118.28
2	53.363000	-1.272020	119.58	1.50	121.08
3	53.362616	-1.269037	120.39	1.50	121.89
4	53.362232	-1.266119	118.92	1.50	120.42
5	53.361890	-1.263510	115.98	1.50	117.48
6	53.361480	-1.260591	110.85	1.50	112.35
7	53.361096	-1.257909	106.11	1.50	107.61
8	53.360546	-1.255442	101.85	1.50	103.35
9	53.359393	-1.253124	100.25	1.50	101.75
10	53.358599	-1.250378	96.86	1.50	98.36
11	53.357703	-1.247867	95.43	1.50	96.93
12	53.356781	-1.246279	96.44	1.50	97.94

Name: Route 5D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361032	-1.255720	103.17	1.50	104.67
2	53.362684	-1.254733	98.24	1.50	99.74
3	53.363401	-1.253907	95.69	1.50	97.19
4	53.364278	-1.251386	97.11	1.50	98.61
5	53.365136	-1.248757	94.85	1.50	96.35
6	53.366026	-1.246097	98.48	1.50	99.98
7	53.366948	-1.243500	99.80	1.50	101.30
8	53.367825	-1.240925	96.76	1.50	98.26
9	53.368664	-1.238404	98.91	1.50	100.41

Name: Route 6D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381006	-1.234249	105.64	1.50	107.14
2	53.379215	-1.234549	105.00	1.50	106.50
3	53.377499	-1.235022	101.62	1.50	103.12
4	53.375758	-1.235494	99.46	1.50	100.96
5	53.373966	-1.235665	100.70	1.50	102.20
6	53.372200	-1.235537	102.10	1.50	103.60

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.383355	-1.251683	109.34	2.00
OP 2	2	53.383595	-1.250439	109.35	2.00
OP 3	3	53.384663	-1.248289	105.86	2.00
OP 4	4	53.383678	-1.246366	103.52	2.00
OP 5	5	53.381683	-1.240134	108.46	2.00
OP 6	6	53.379593	-1.234054	105.00	2.00
OP 7	7	53.376249	-1.235028	100.31	2.00
OP 8	8	53.370611	-1.255135	96.29	2.00
OP 9	9	53.364903	-1.238123	96.27	2.00
OP 10	10	53.365570	-1.246672	97.24	2.00
OP 11	11	53.364672	-1.249349	95.97	2.00
OP 12	12	53.363536	-1.252706	96.11	2.00
OP 13	13	53.360383	-1.246192	93.42	2.00
OP 14	14	53.359097	-1.252812	99.32	2.00
OP 15	15	53.361543	-1.255970	104.65	2.00
OP 16	16	53.358951	-1.256570	108.59	2.00
OP 17	17	53.356749	-1.257538	119.68	2.00
OP 18	18	53.362991	-1.261851	114.83	2.00
OP 19	19	53.364867	-1.263063	120.67	2.00
OP 20	20	53.366291	-1.278697	118.27	2.00
OP 21	21	53.371527	-1.277892	110.75	2.00
OP 22	22	53.372500	-1.277796	112.02	2.00
OP 23	23	53.371796	-1.272394	111.12	2.00
OP 24	24	53.372958	-1.269545	112.15	2.00
OP 25	25	53.376424	-1.262688	100.79	2.00
OP 26	26	53.380306	-1.265001	110.66	2.00
OP 27	27	53.381070	-1.279607	109.35	2.00
OP 28	28	53.382068	-1.276726	111.16	2.00
OP 29	29	53.382335	-1.273413	111.90	2.00
OP 30	30	53.383395	-1.274753	112.25	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	10,899	181.7	2,747	45.8	-
PV array 2	8.0	180.0	95,013	1,583.5	101,341	1,689.0	-
PV array 3	8.0	180.0	15,543	259.1	19,527	325.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1D	601	10.0	3,239	54.0
PRoW 2D	74,834	1,247.2	79,057	1,317.6
PRoW 3D	1,447	24.1	4,948	82.5
PRoW 4D	0	0.0	0	0.0
Route 1D	65	1.1	1,572	26.2
Route 2D	100	1.7	1,869	31.1
Route 3D	2,162	36.0	710	11.8
Route 4D	2,204	36.7	851	14.2
Route 5D	963	16.1	2,128	35.5
Route 6D	0	0.0	0	0.0
OP 1	1,971	32.9	612	10.2
OP 2	1,712	28.5	270	4.5
OP 3	574	9.6	0	0.0
OP 4	1,025	17.1	0	0.0
OP 5	1,842	30.7	325	5.4
OP 6	1,799	30.0	596	9.9
OP 7	2,357	39.3	1,273	21.2
OP 8	2,539	42.3	258	4.3
OP 9	2,371	39.5	866	14.4
OP 10	1,026	17.1	1,885	31.4
OP 11	0	0.0	0	0.0
OP 12	929	15.5	395	6.6
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	821	13.7	1,359	22.6
OP 19	1,586	26.4	4,268	71.1
OP 20	1,192	19.9	1,944	32.4

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 21	894	14.9	129	2.1
OP 22	1,604	26.7	146	2.4
OP 23	1,506	25.1	689	11.5
OP 24	3,280	54.7	463	7.7
OP 25	1,797	29.9	2,067	34.5
OP 26	3,219	53.6	6,867	114.5
OP 27	1,182	19.7	890	14.8
OP 28	1,130	18.8	897	14.9
OP 29	1,404	23.4	2,577	43.0
OP 30	1,319	22.0	465	7.8

PV: PV array 1 potential temporary after-image

Receptor results ordered by category of glare

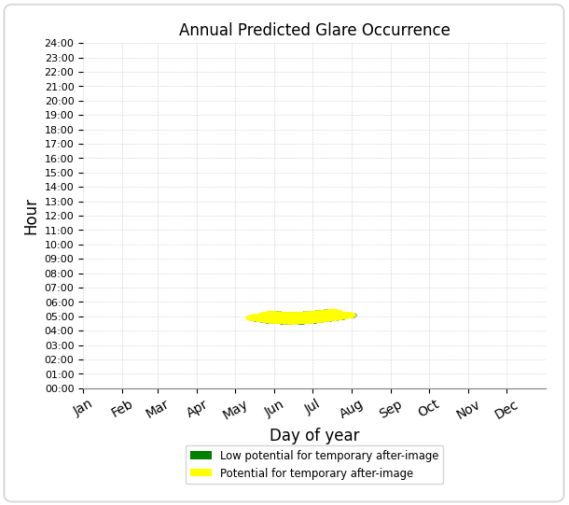
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 2D	100	1.7	1,869	31.1
Route 3D	1,270	21.2	0	0.0
PRoW 1D	0	0.0	0	0.0
PRoW 2D	0	0.0	0	0.0
PRoW 3D	0	0.0	0	0.0
PRoW 4D	0	0.0	0	0.0
Route 1D	0	0.0	0	0.0
Route 4D	0	0.0	0	0.0
Route 5D	0	0.0	0	0.0
Route 6D	0	0.0	0	0.0
OP 29	933	15.6	534	8.9
OP 30	932	15.5	344	5.7
OP 1	983	16.4	0	0.0
OP 2	856	14.3	0	0.0
OP 3	471	7.8	0	0.0
OP 4	628	10.5	0	0.0
OP 5	912	15.2	0	0.0
OP 6	914	15.2	0	0.0
OP 7	1,208	20.1	0	0.0
OP 26	1,692	28.2	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

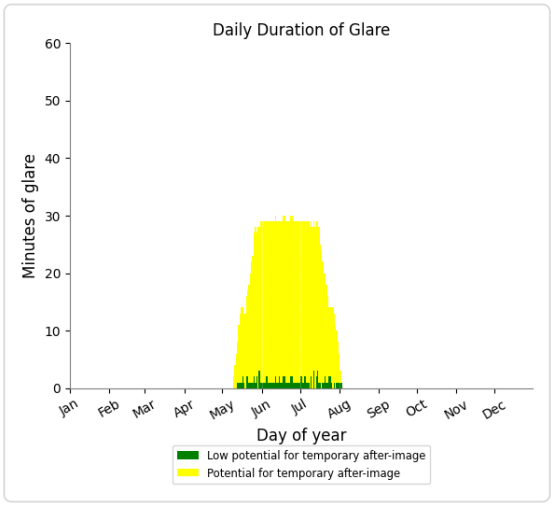
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 25	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0

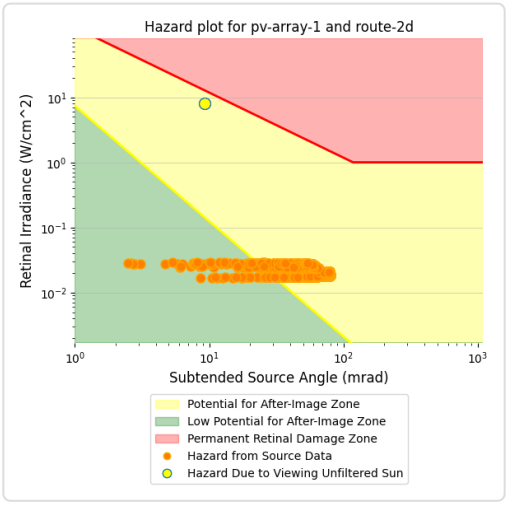
PV array 1 and Route: Route 2D

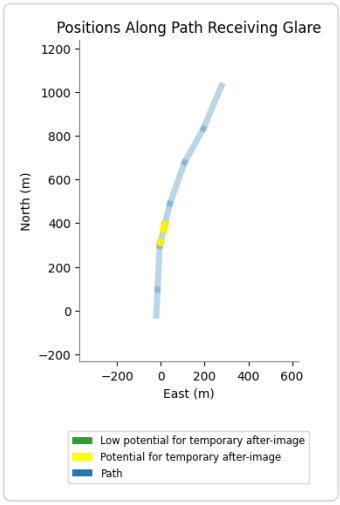
Yellow glare: 1,869 min.

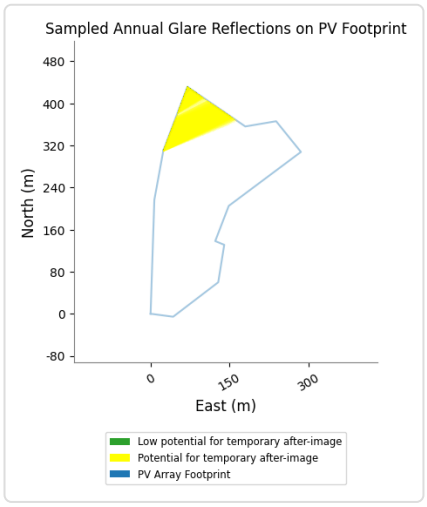
Green glare: 100 min.







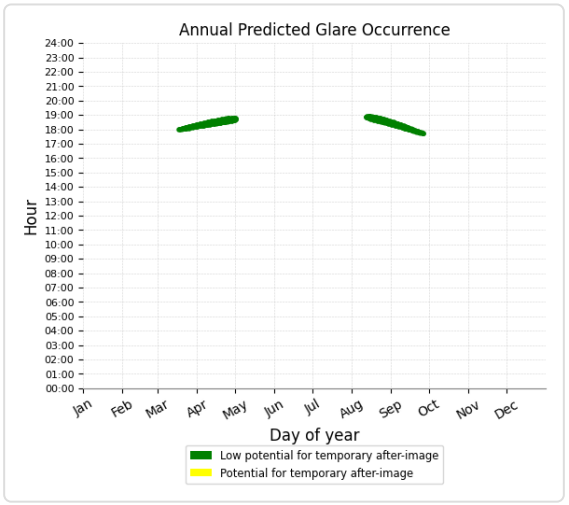


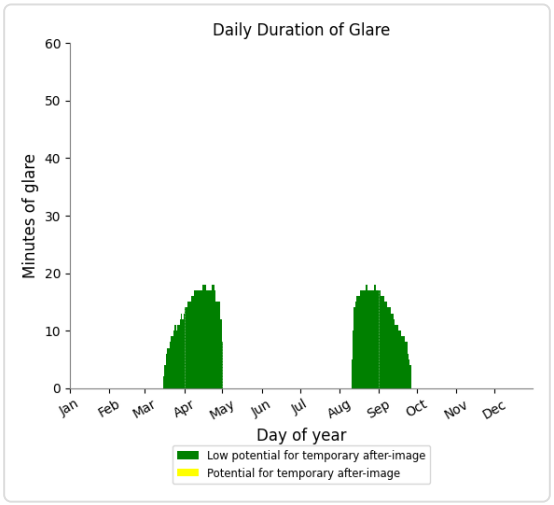


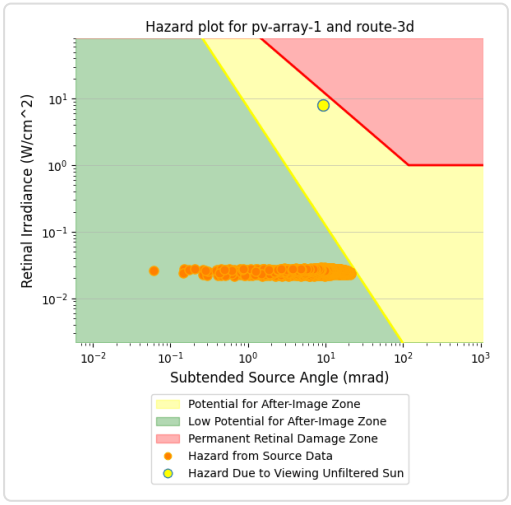
PV array 1 and Route: Route 3D

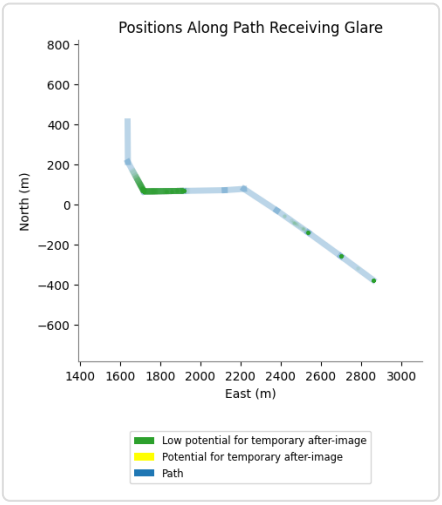
Yellow glare: none

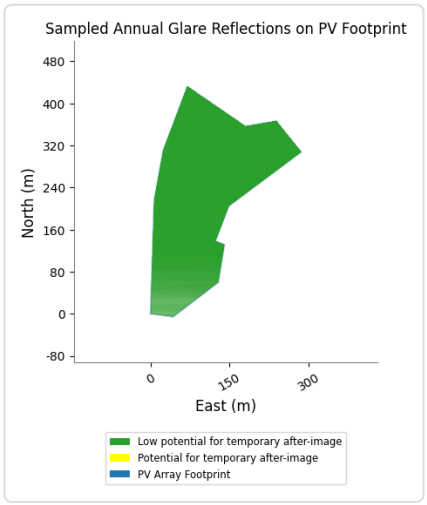
Green glare: 1,270 min.











PV array 1 and Route: PRoW 1D

No glare found

PV array 1 and Route: PRoW 2D

No glare found

PV array 1 and Route: PRoW 3D

No glare found

PV array 1 and Route: PRoW 4D

No glare found

PV array 1 and Route: Route 1D

No glare found

PV array 1 and Route: Route 4D

No glare found

PV array 1 and Route: Route 5D

No glare found

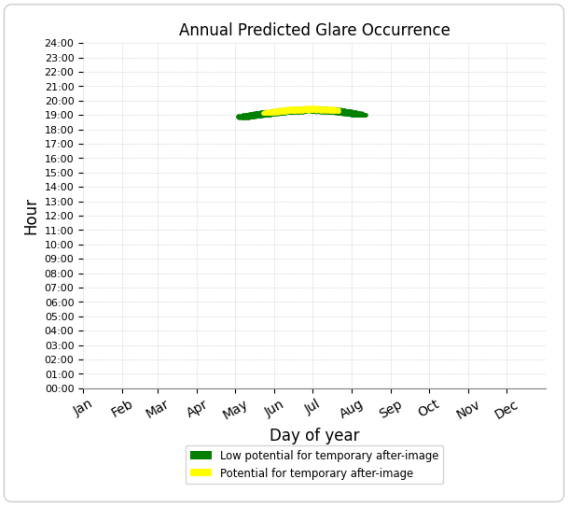
PV array 1 and Route: Route 6D

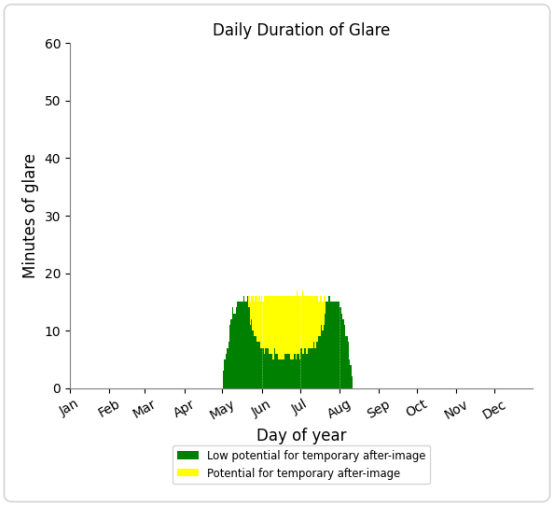
No glare found

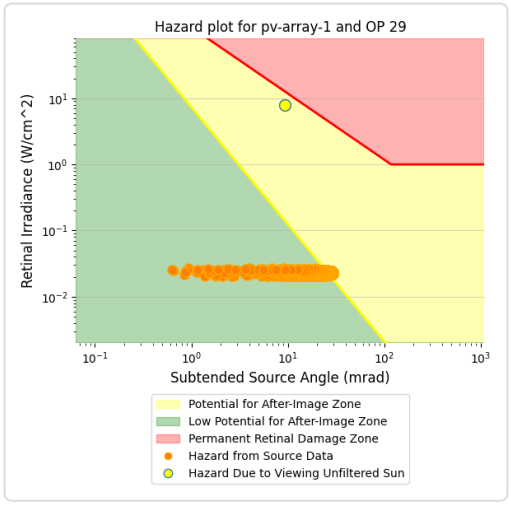
PV array 1 and OP 29

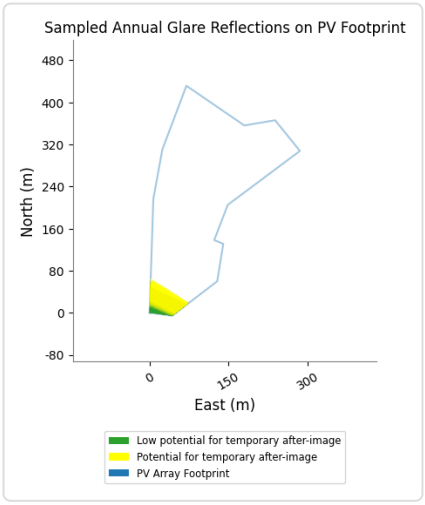
Yellow glare: 534 min.

Green glare: 933 min.





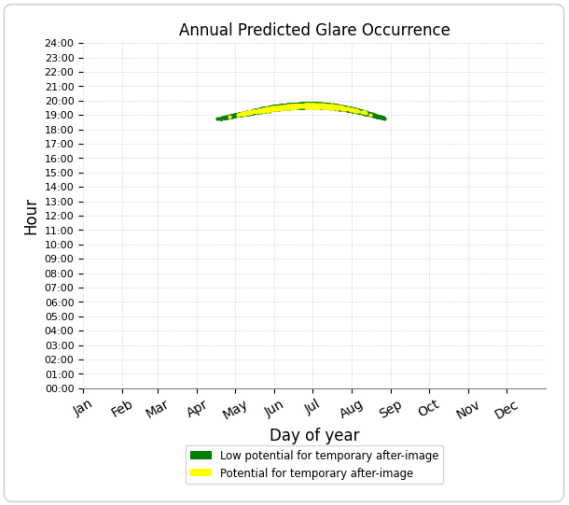


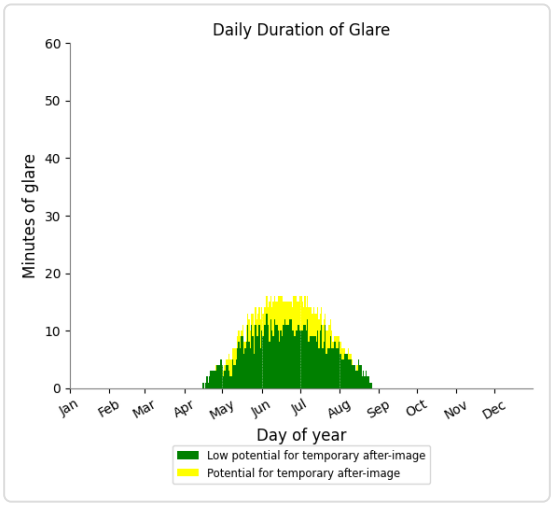


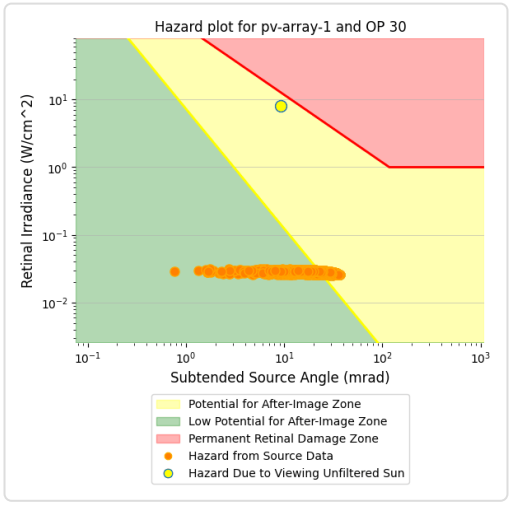
PV array 1 and OP 30

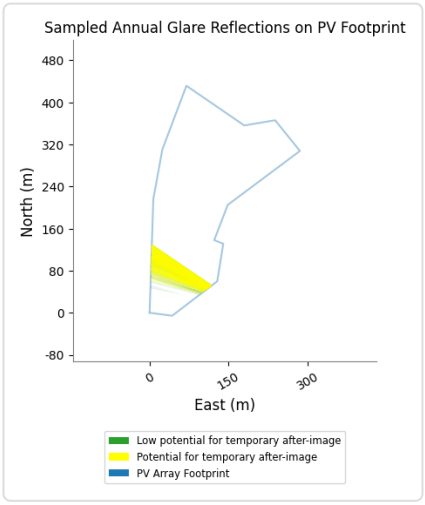
Yellow glare: 344 min.

Green glare: 932 min.





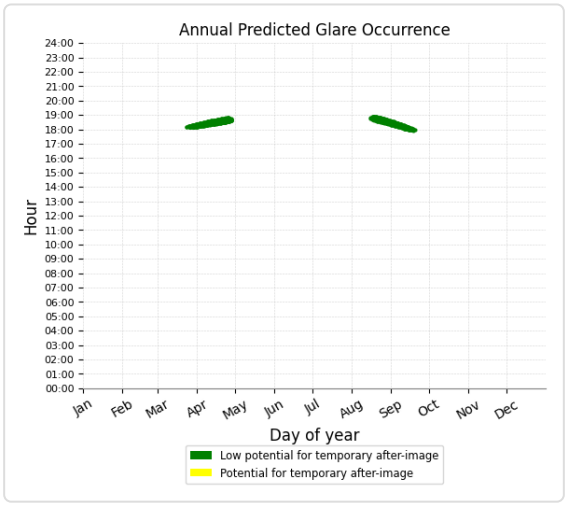


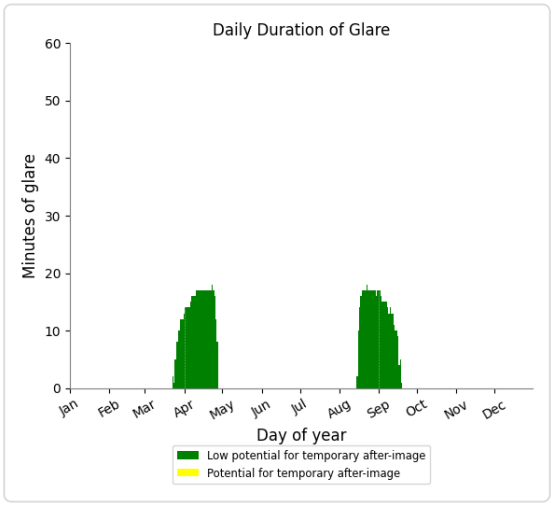


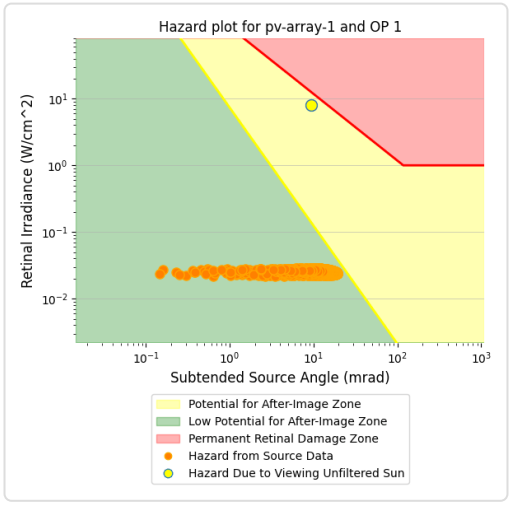
PV array 1 and OP 1

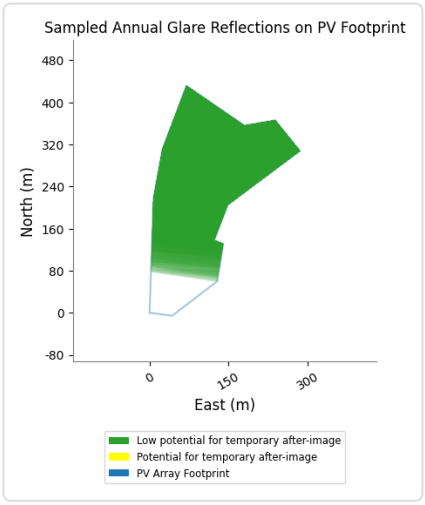
Yellow glare: none

Green glare: 983 min.





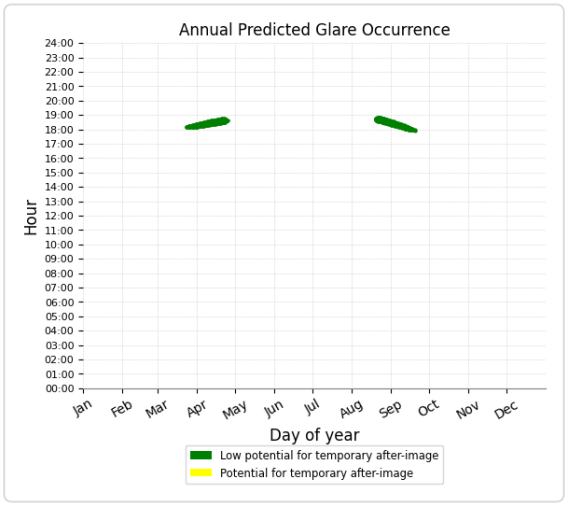


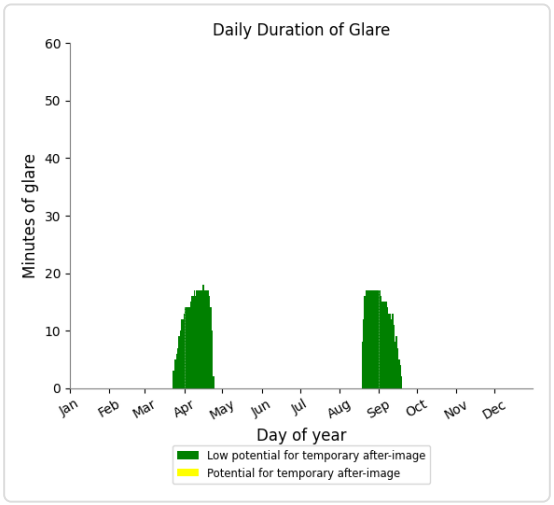


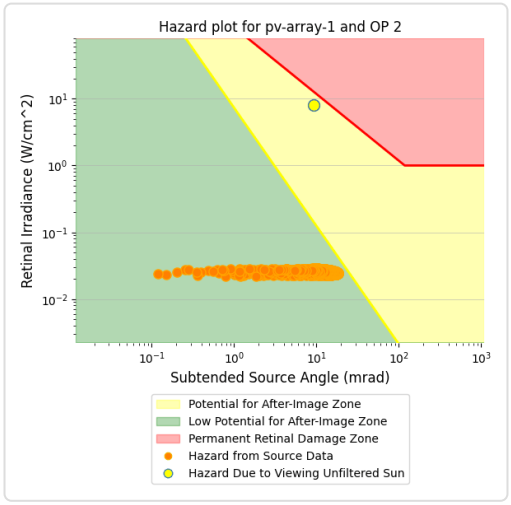
PV array 1 and OP 2

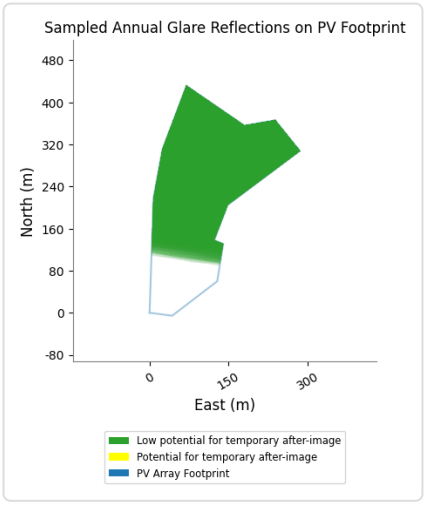
Yellow glare: none

Green glare: 856 min.





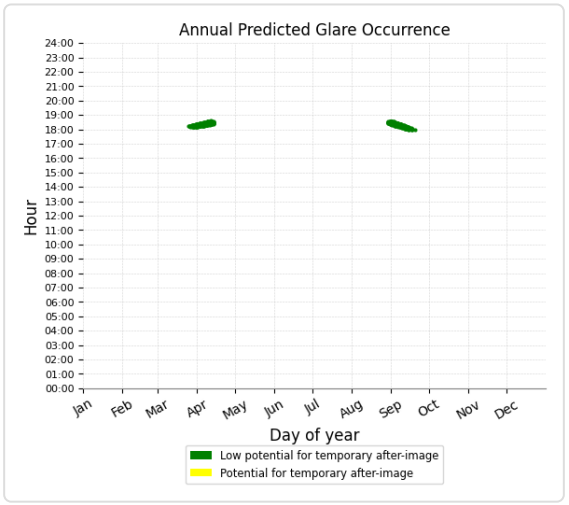


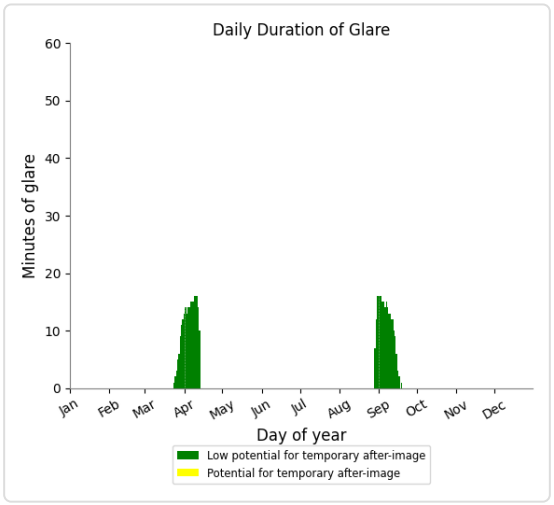


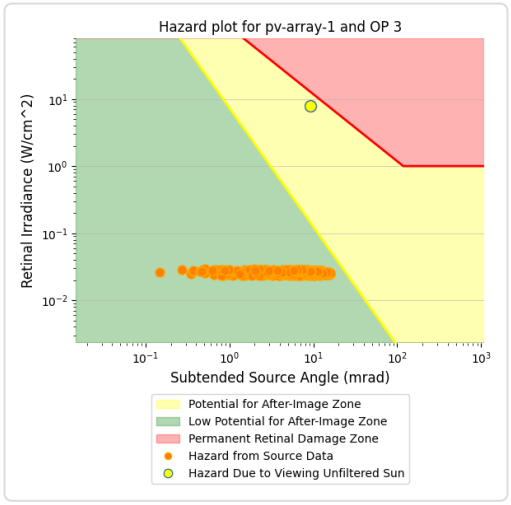
PV array 1 and OP 3

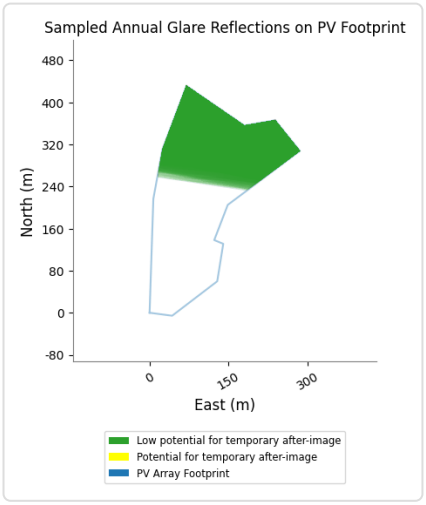
Yellow glare: none

Green glare: 471 min.





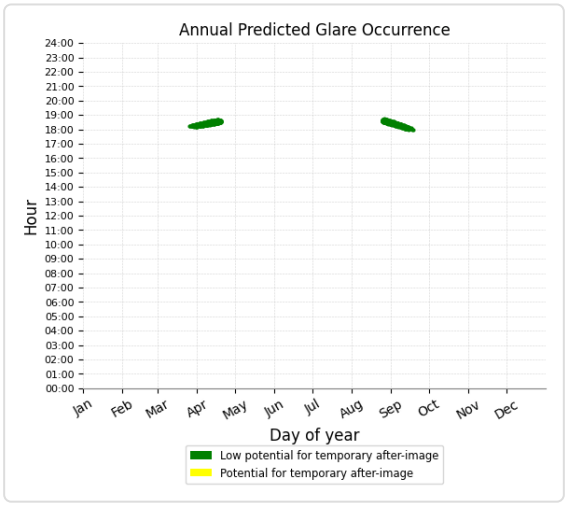


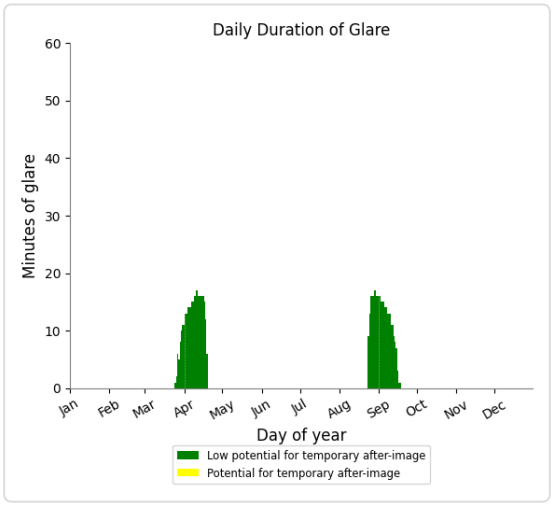


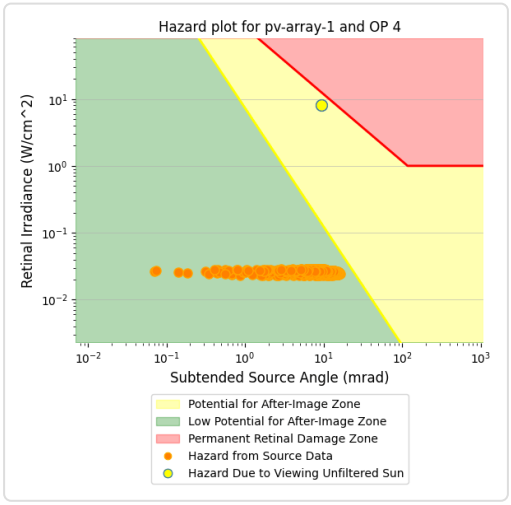
PV array 1 and OP 4

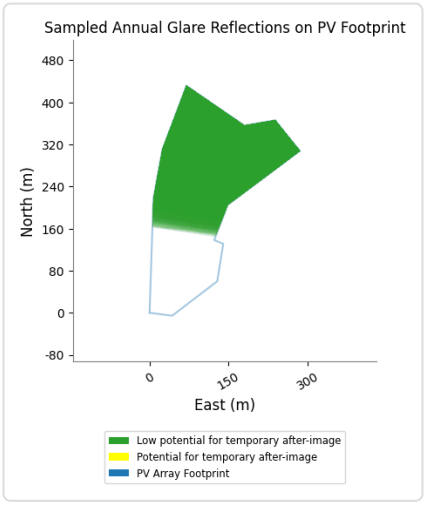
Yellow glare: none

Green glare: 628 min.





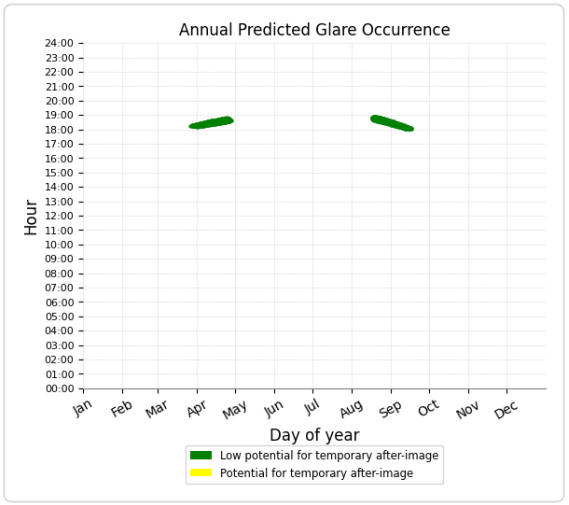


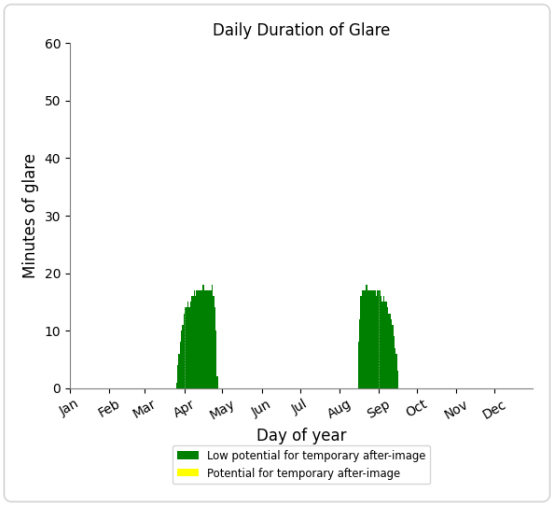


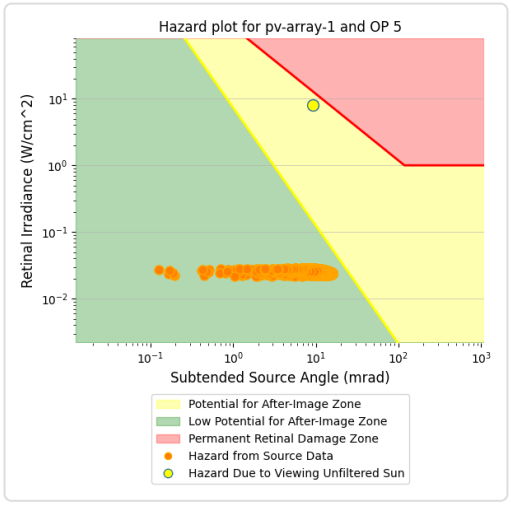
PV array 1 and OP 5

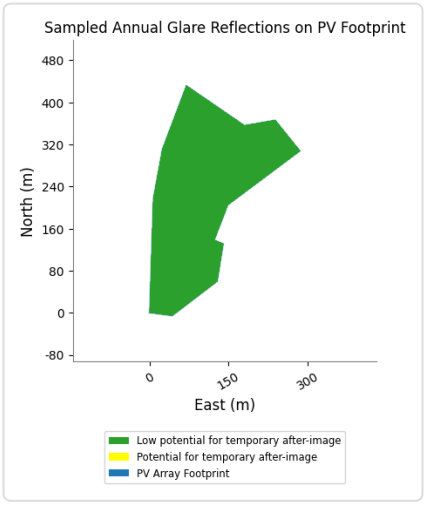
Yellow glare: none

Green glare: 912 min.





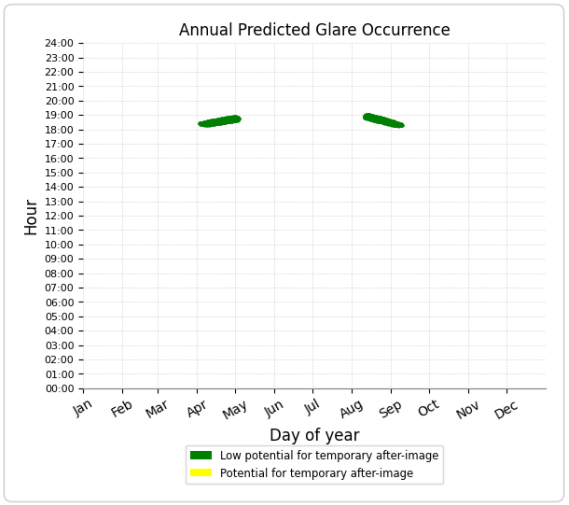


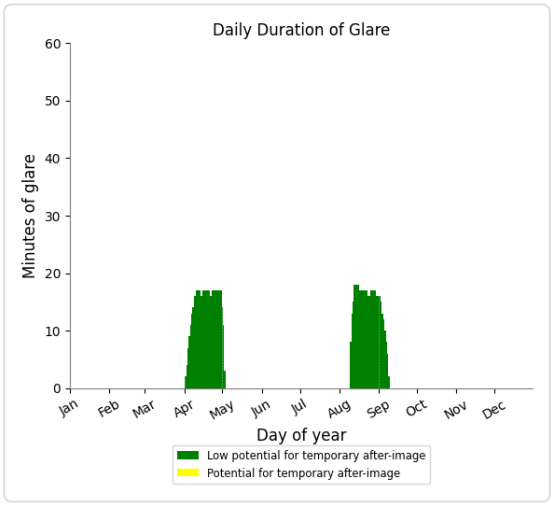


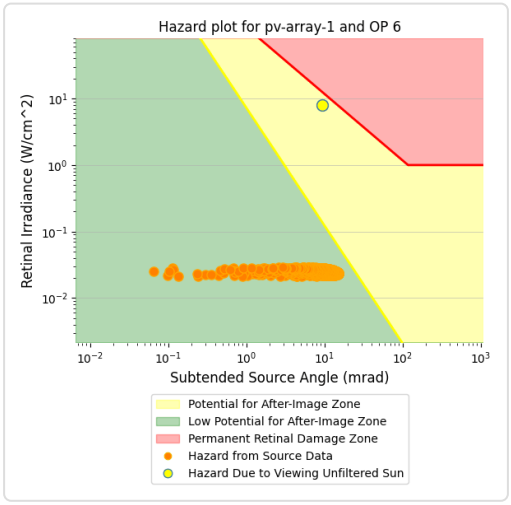
PV array 1 and OP 6

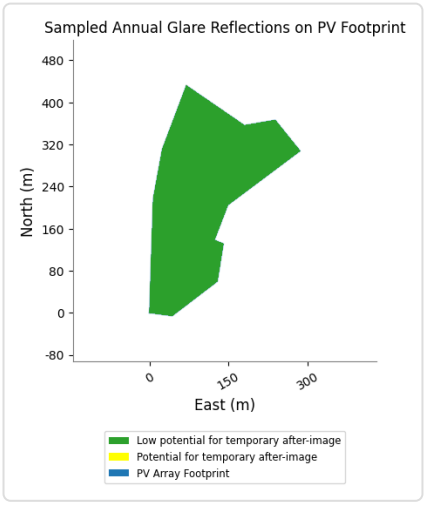
Yellow glare: none

Green glare: 914 min.





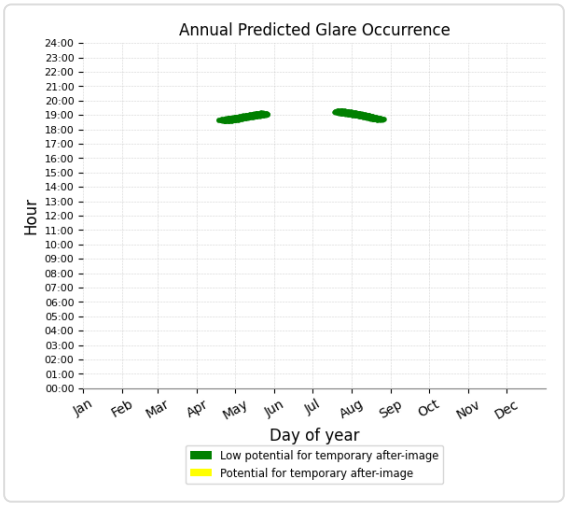


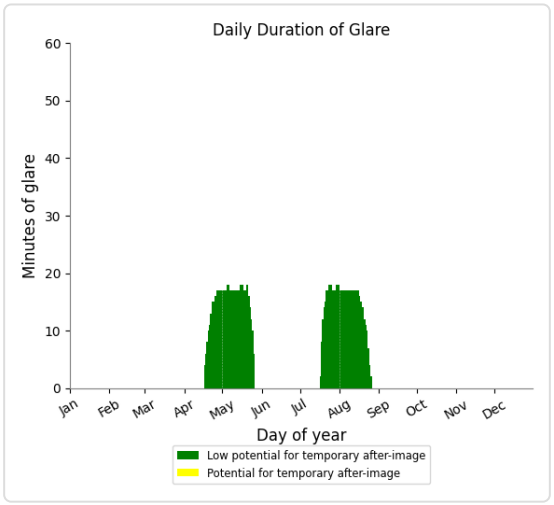


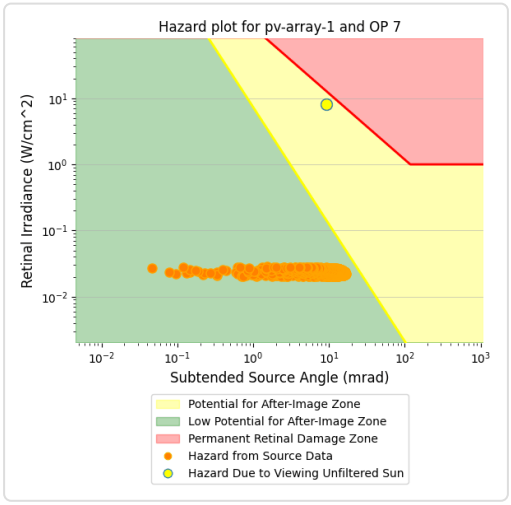
PV array 1 and OP 7

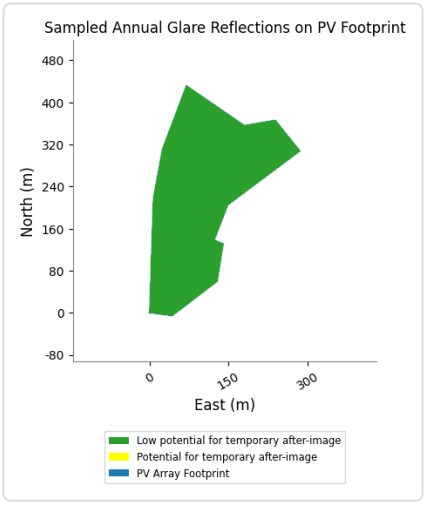
Yellow glare: none

Green glare: 1,208 min.





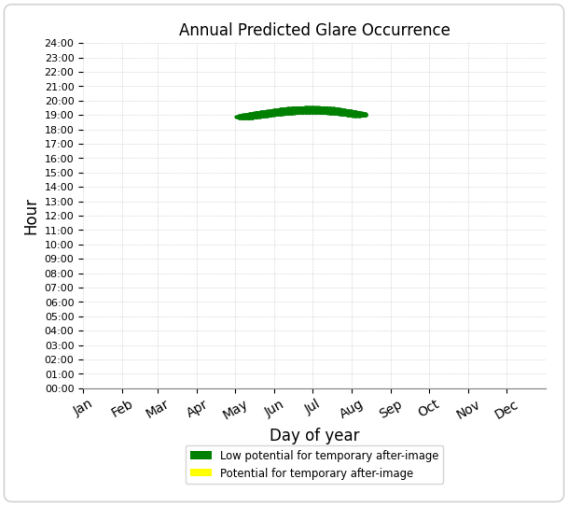


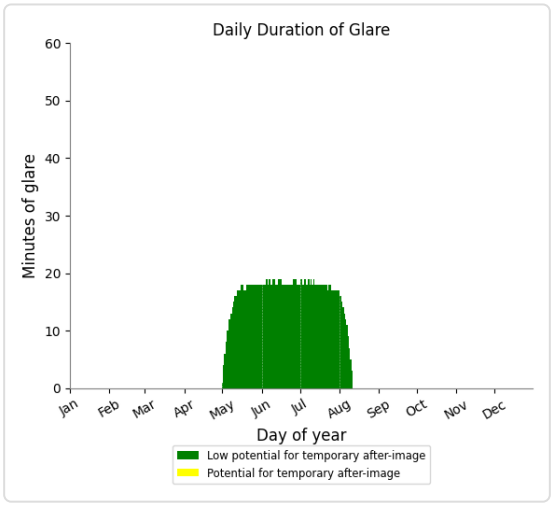


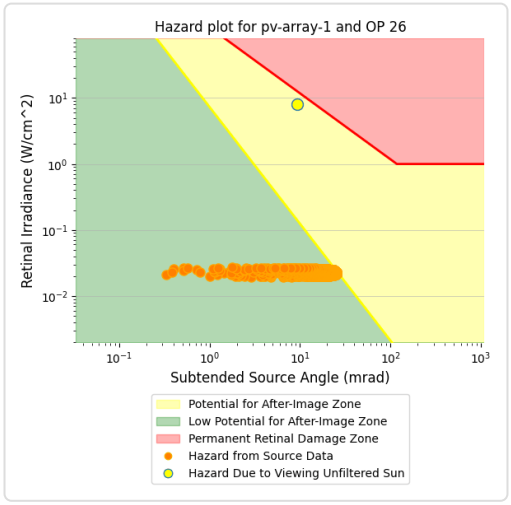
PV array 1 and OP 26

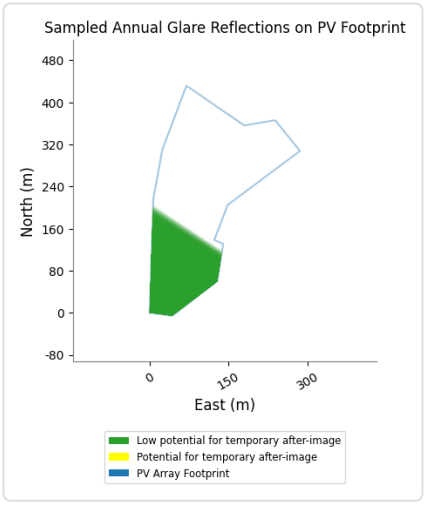
Yellow glare: none

Green glare: 1,692 min.









PV array 1 and OP 8

No glare found

PV array 1 and OP 9

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 11

No glare found

PV array 1 and OP 12

No glare found

PV array 1 and OP 13

No glare found

PV array 1 and OP 14

No glare found

PV array 1 and OP 15

No glare found

PV array 1 and OP 16

No glare found

PV array 1 and OP 17

No glare found

PV array 1 and OP 18

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 22

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV array 1 and OP 27

No glare found

PV array 1 and OP 28

No glare found

PV: PV array 2 potential temporary after-image

Receptor results ordered by category of glare

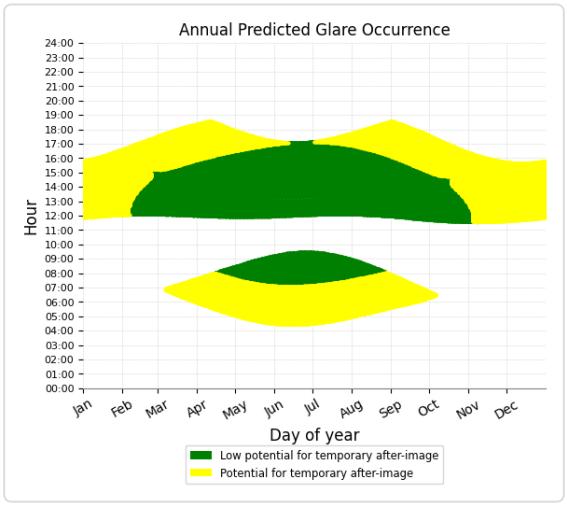
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2D	74,195	1,236.6	78,203	1,303.4
PRoW 3D	736	12.3	4,638	77.3
Route 1D	65	1.1	1,572	26.2
Route 3D	892	14.9	710	11.8
Route 5D	585	9.8	61	1.0
PRoW 1D	203	3.4	0	0.0
PRoW 4D	0	0.0	0	0.0
Route 2D	0	0.0	0	0.0
Route 4D	0	0.0	0	0.0
Route 6D	0	0.0	0	0.0
OP 1	988	16.5	612	10.2
OP 2	856	14.3	270	4.5
OP 5	930	15.5	325	5.4
OP 6	885	14.8	596	9.9
OP 7	1,149	19.1	1,273	21.2
OP 22	833	13.9	146	2.4
OP 24	2,197	36.6	50	0.8
OP 25	1,797	29.9	2,067	34.5
OP 26	1,527	25.4	6,867	114.5
OP 27	1,182	19.7	890	14.8
OP 28	1,130	18.8	897	14.9
OP 29	471	7.8	2,043	34.0
OP 30	387	6.5	121	2.0
OP 3	103	1.7	0	0.0
OP 4	397	6.6	0	0.0
OP 8	1,542	25.7	0	0.0
OP 9	1,044	17.4	0	0.0
OP 10	390	6.5	0	0.0
OP 23	529	8.8	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0

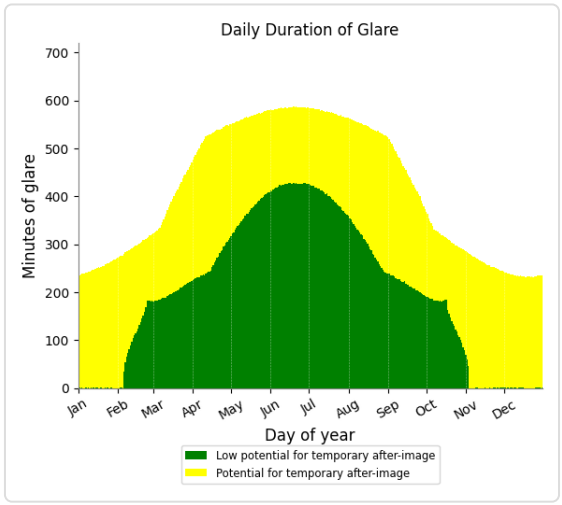
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 21	0	0.0	0	0.0

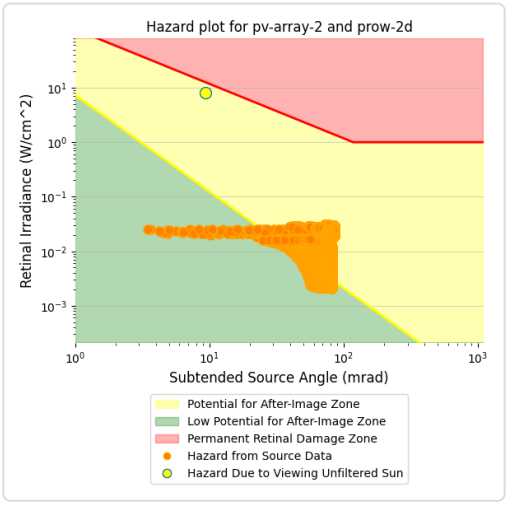
PV array 2 and Route: PRoW 2D

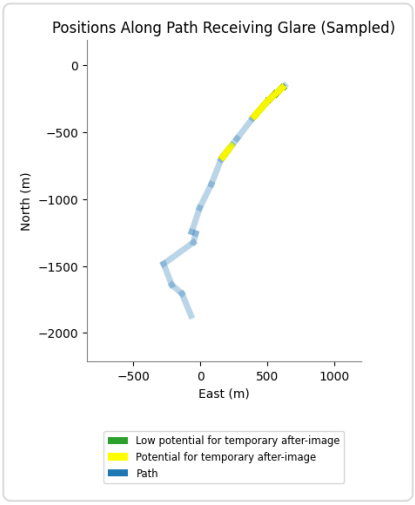
Yellow glare: 78,203 min.

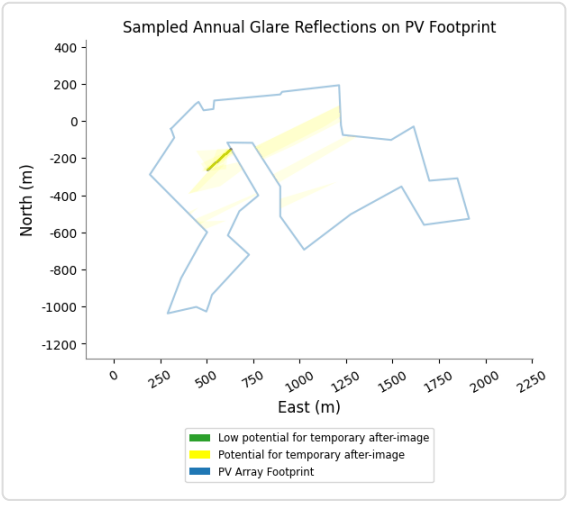
Green glare: 74,195 min.







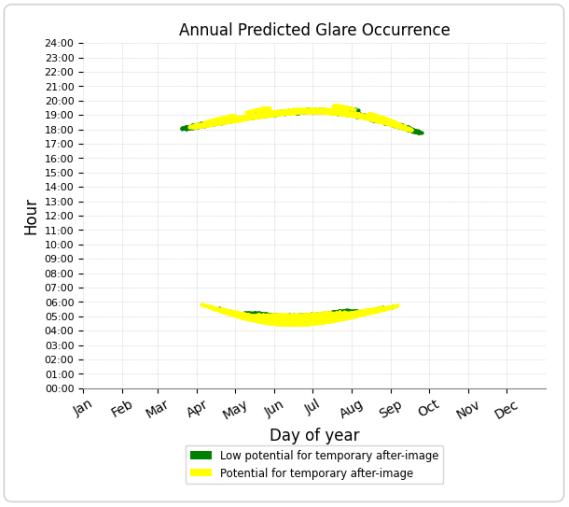


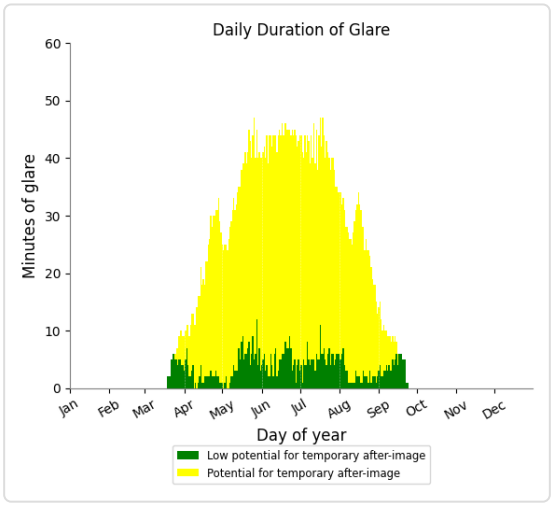


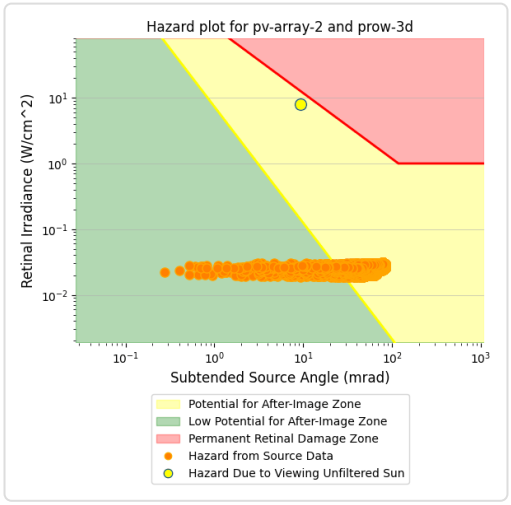
PV array 2 and Route: PRoW 3D

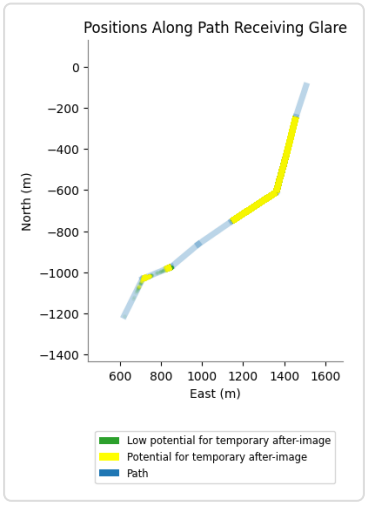
Yellow glare: 4,638 min.

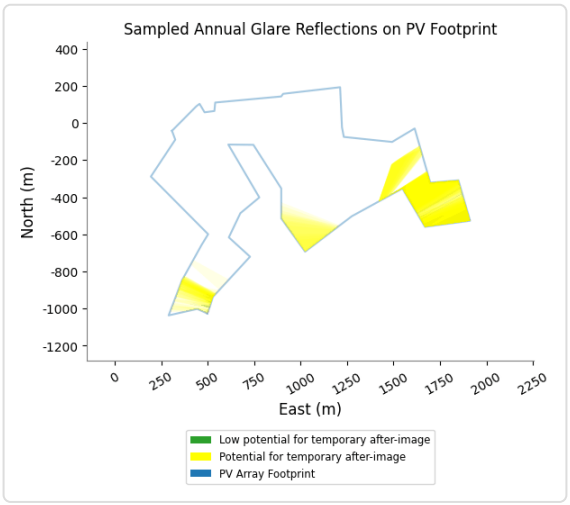
Green glare: 736 min.







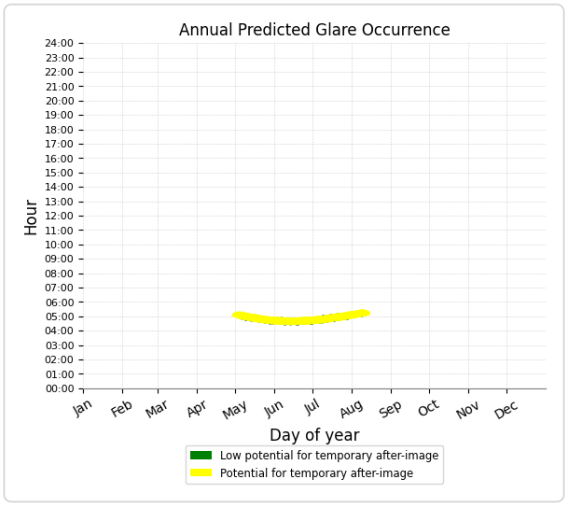


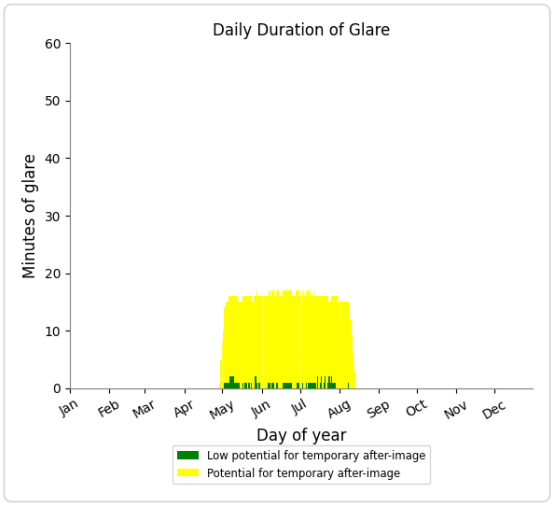


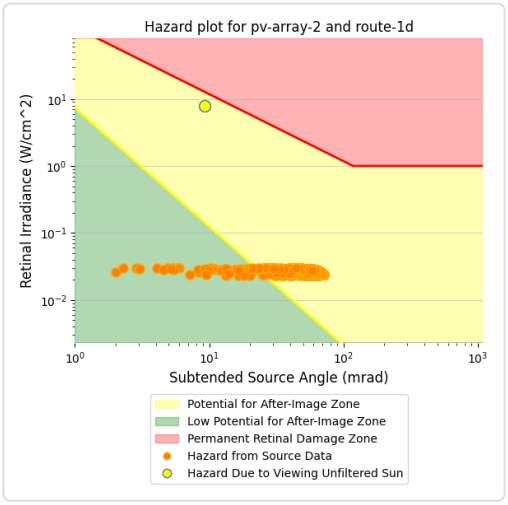
PV array 2 and Route: Route 1D

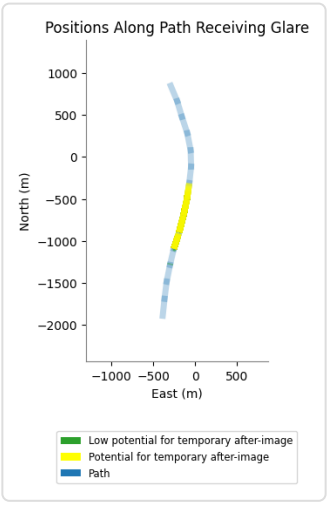
Yellow glare: 1,572 min.

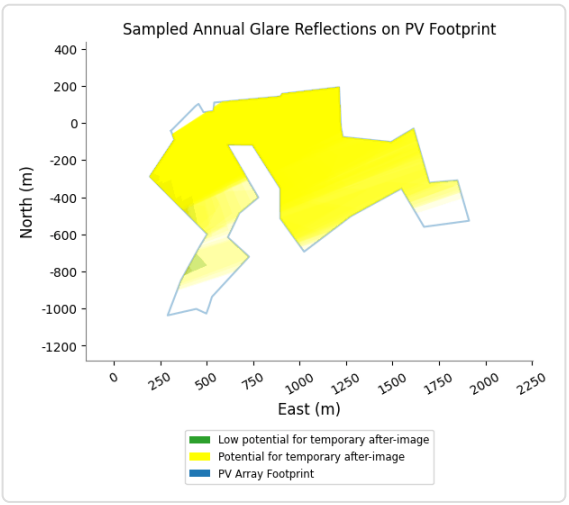
Green glare: 65 min.







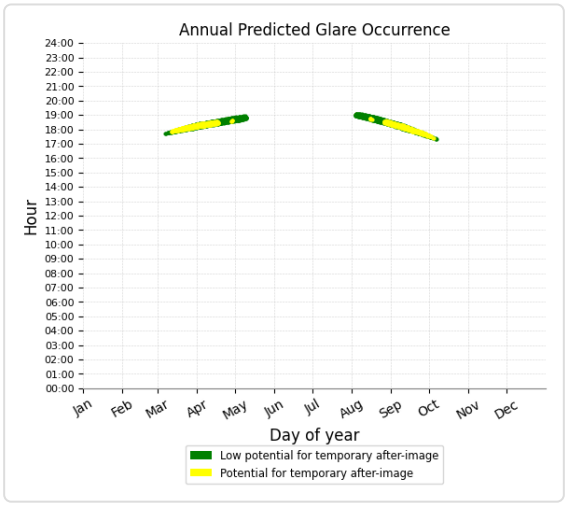


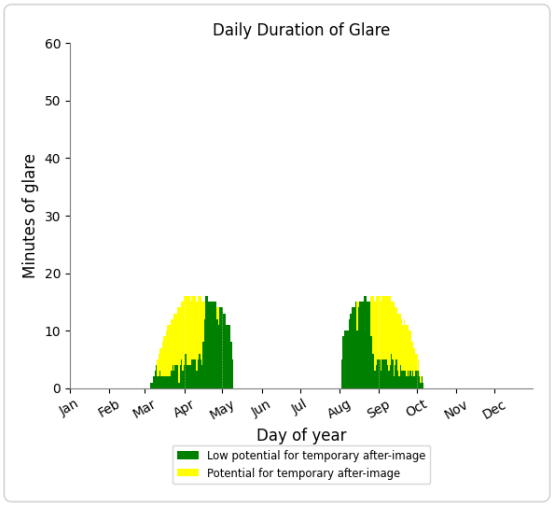


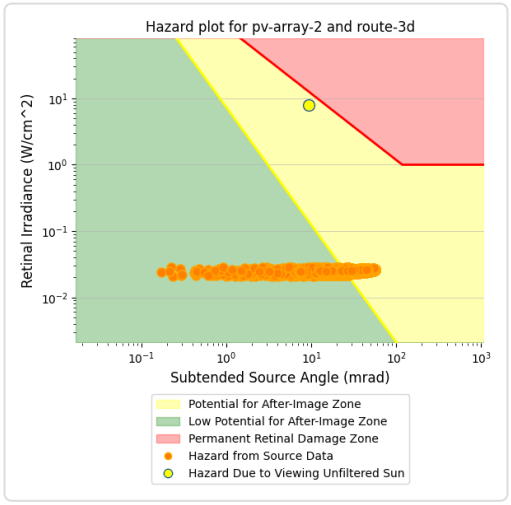
PV array 2 and Route: Route 3D

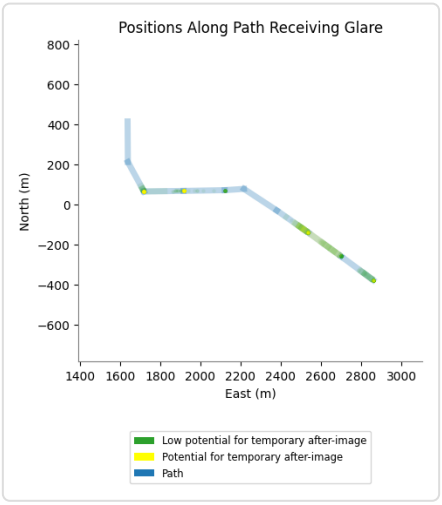
Yellow glare: 710 min.

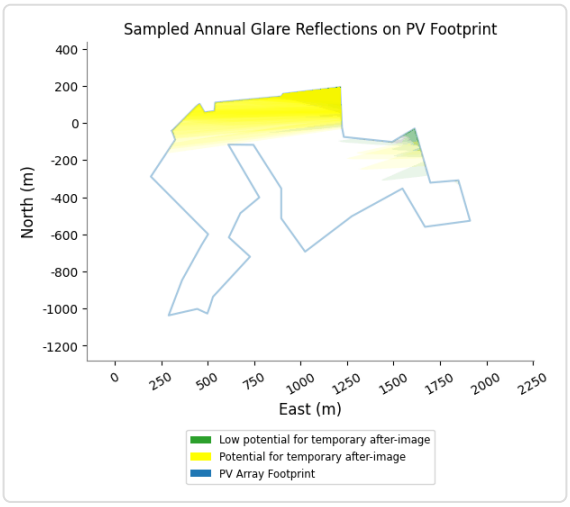
Green glare: 892 min.







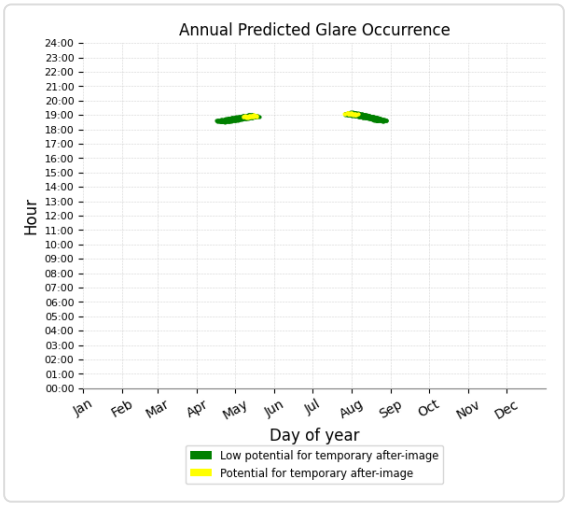


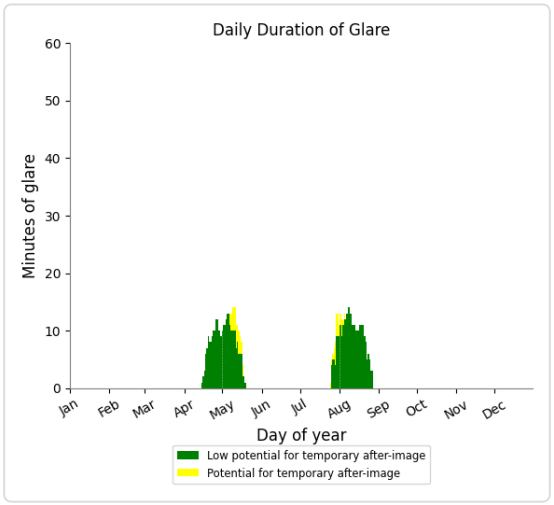


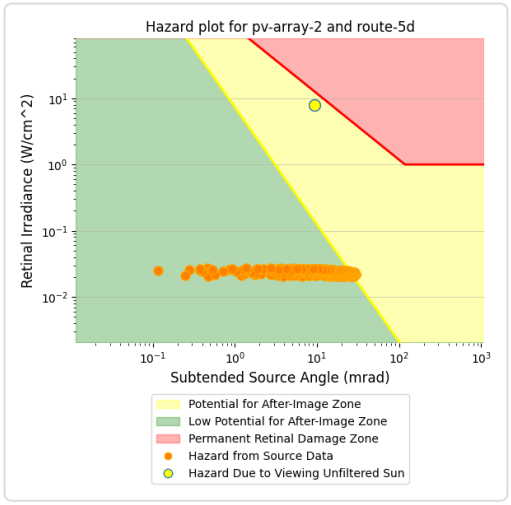
PV array 2 and Route: Route 5D

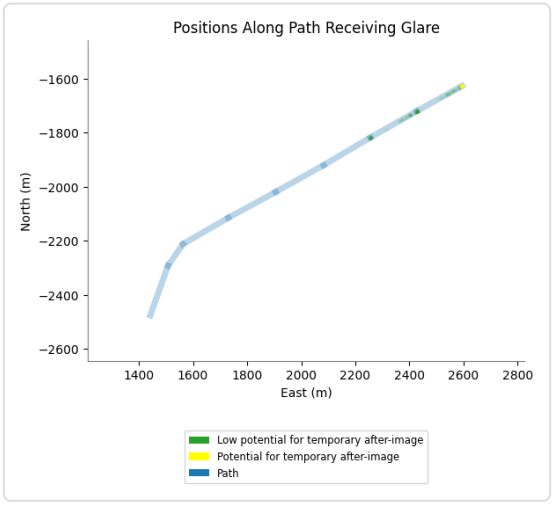
Yellow glare: 61 min.

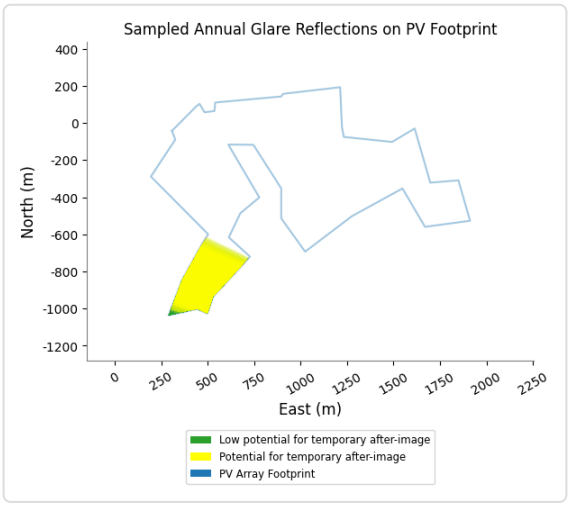
Green glare: 585 min.







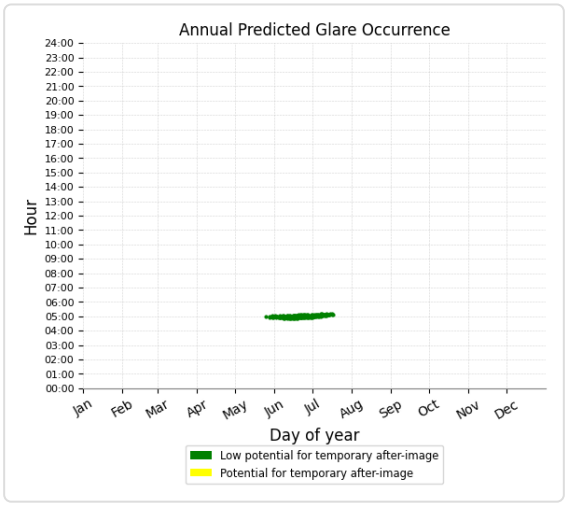


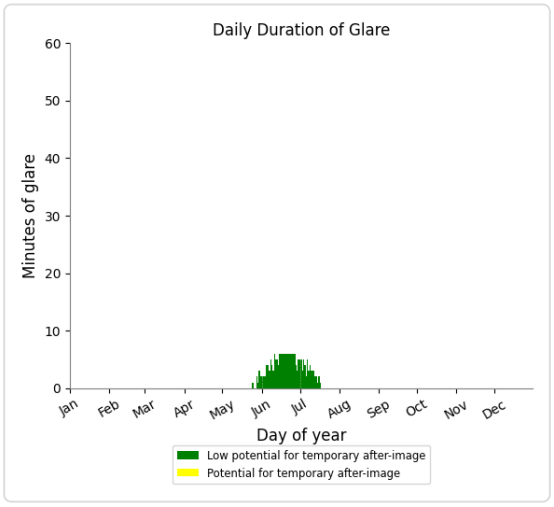


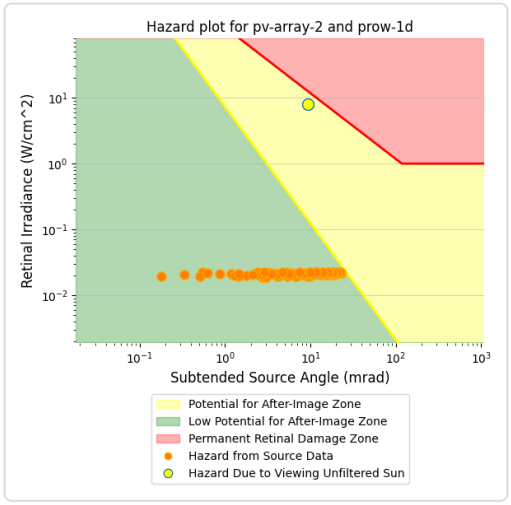
PV array 2 and Route: PRoW 1D

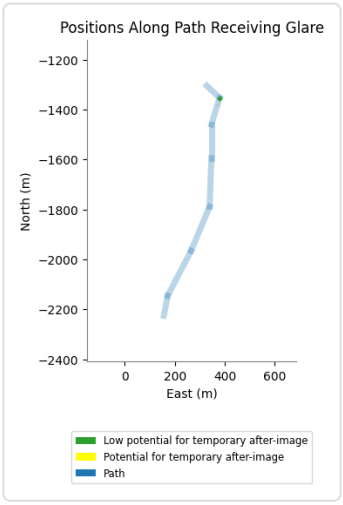
Yellow glare: none

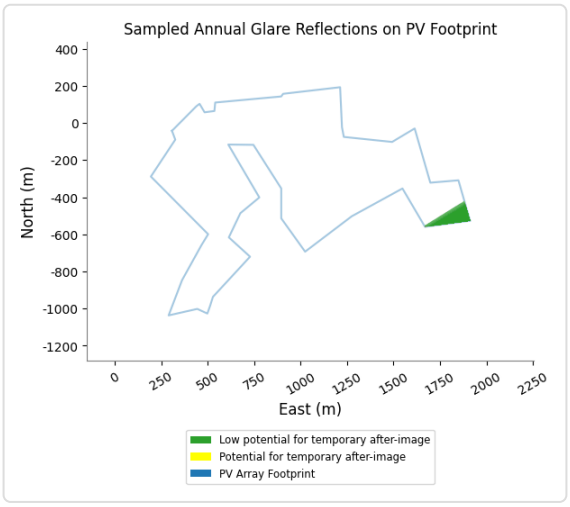
Green glare: 203 min.











PV array 2 and Route: PRoW 4D

No glare found

PV array 2 and Route: Route 2D

No glare found

PV array 2 and Route: Route 4D

No glare found

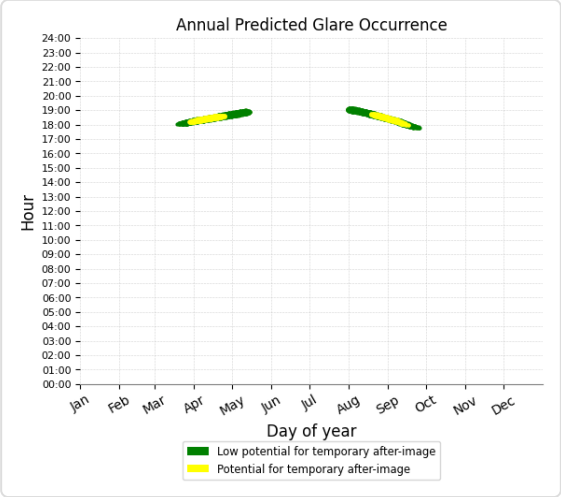
PV array 2 and Route: Route 6D

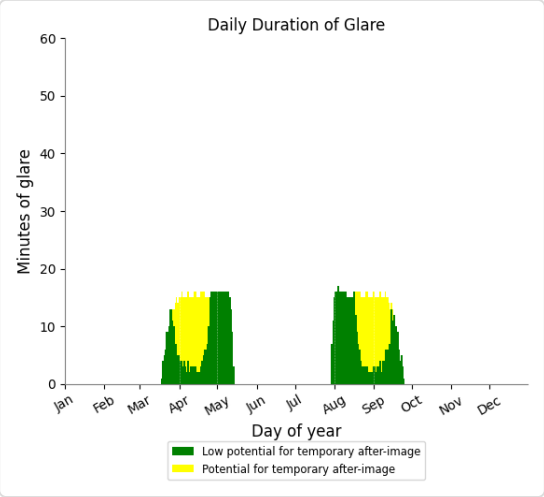
No glare found

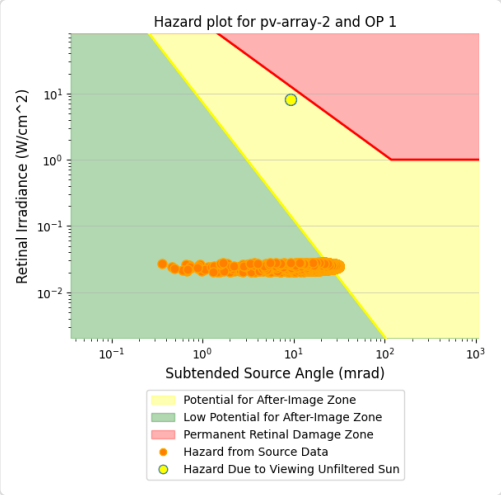
PV array 2 and OP 1

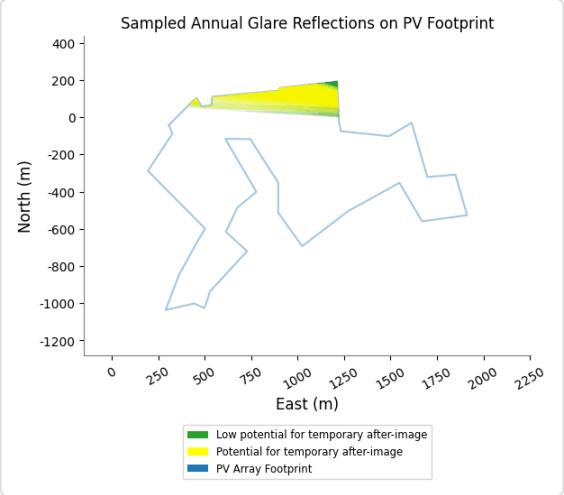
Yellow glare: 612 min.

Green glare: 988 min.





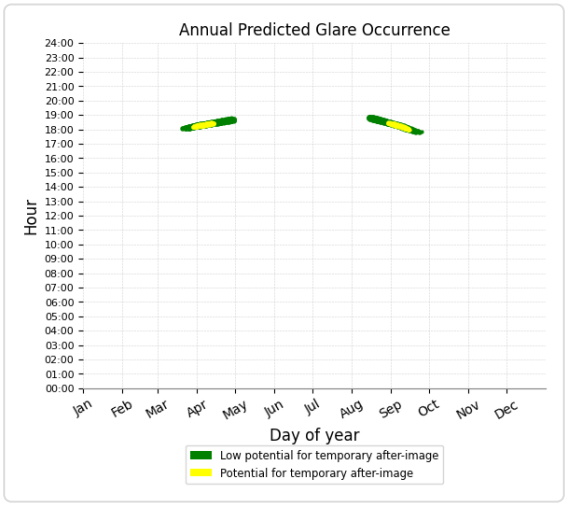


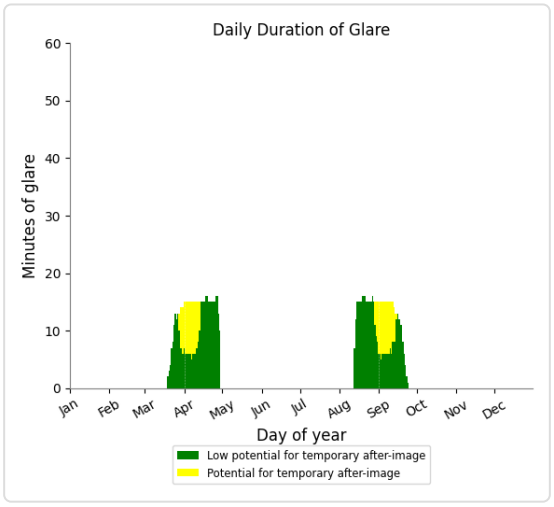


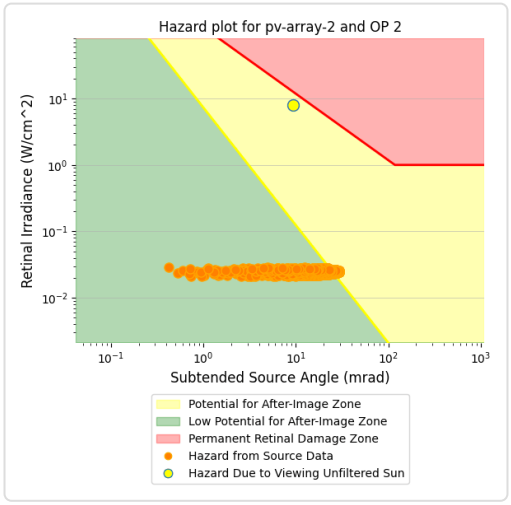
PV array 2 and OP 2

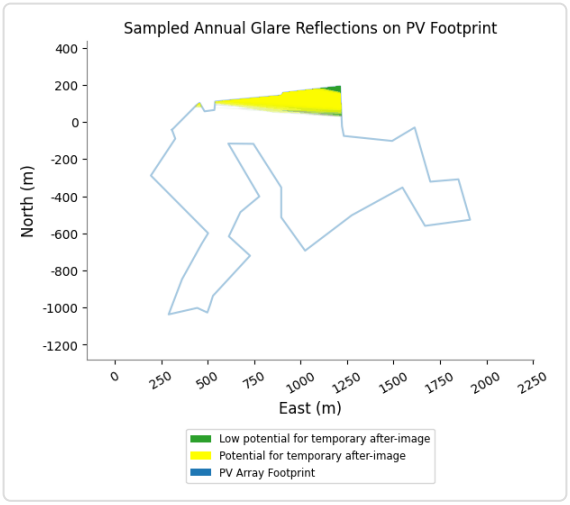
Yellow glare: 270 min.

Green glare: 856 min.





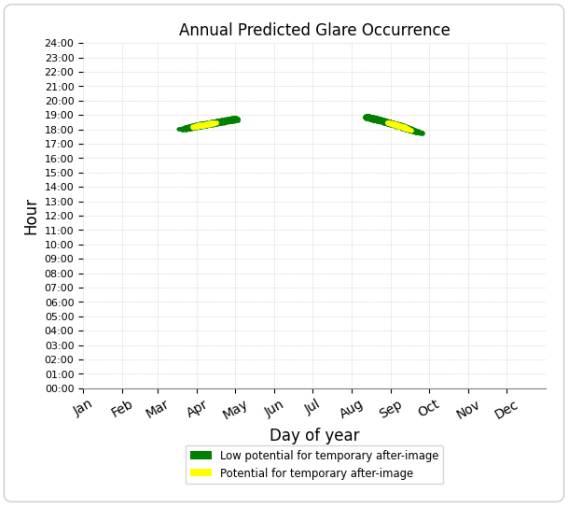


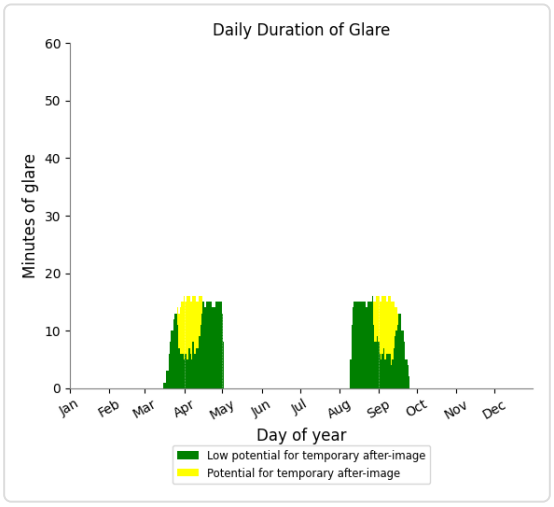


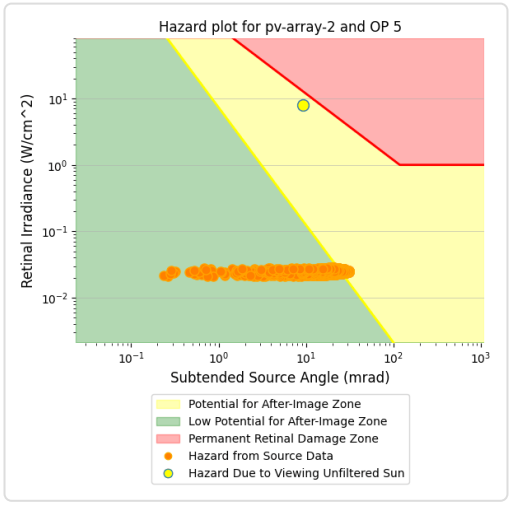
PV array 2 and OP 5

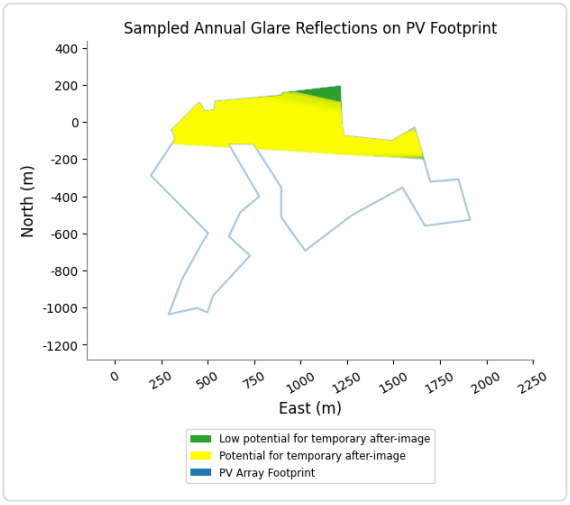
Yellow glare: 325 min.

Green glare: 930 min.





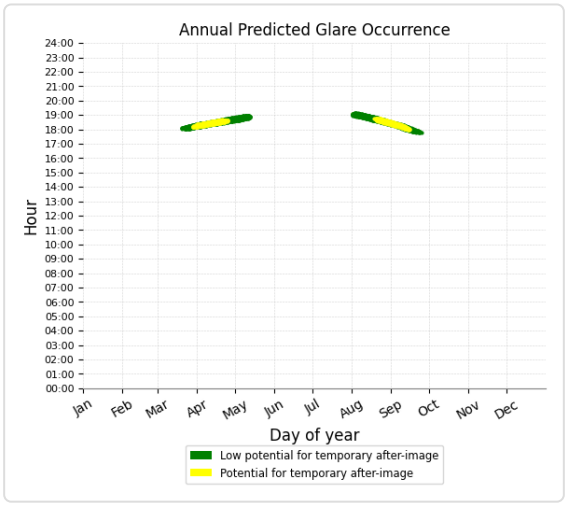


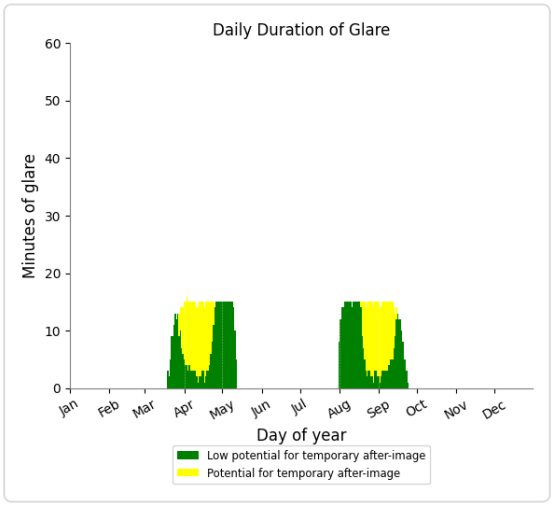


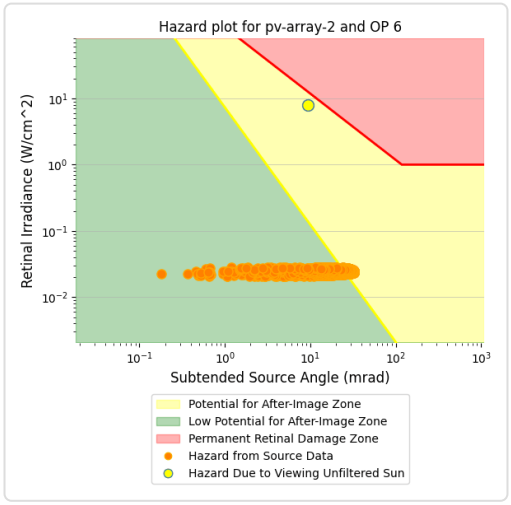
PV array 2 and OP 6

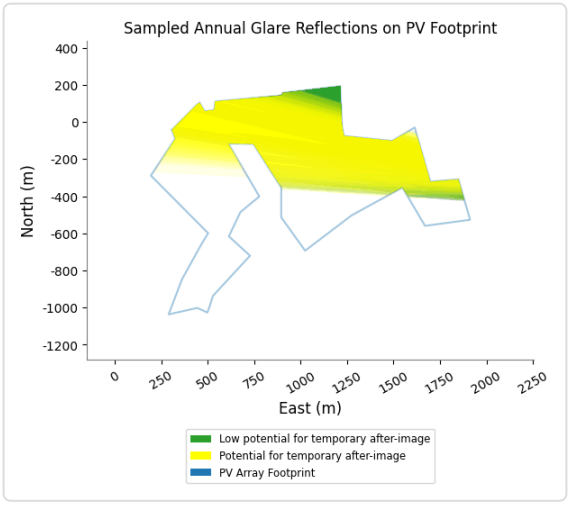
Yellow glare: 596 min.

Green glare: 885 min.





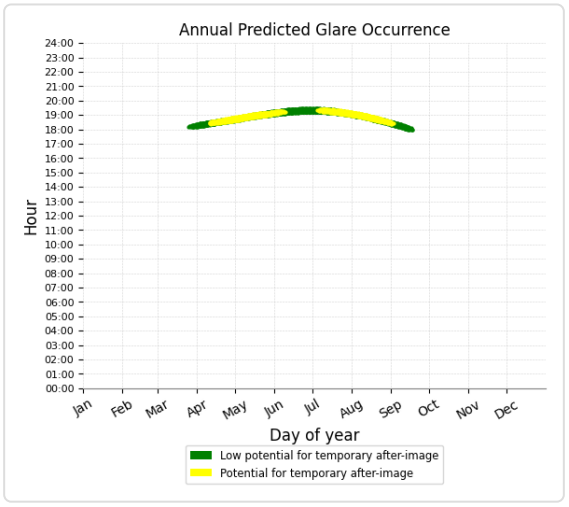


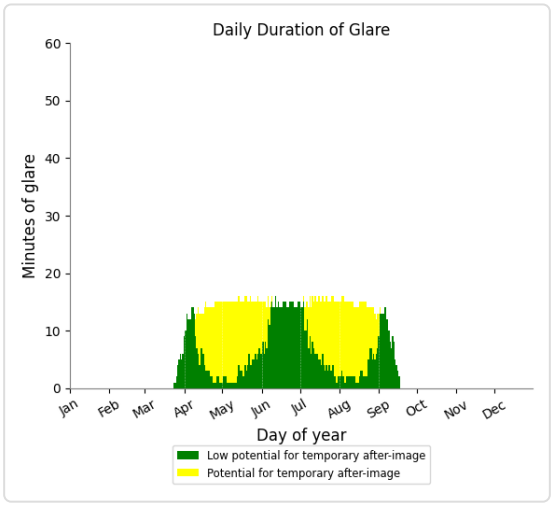


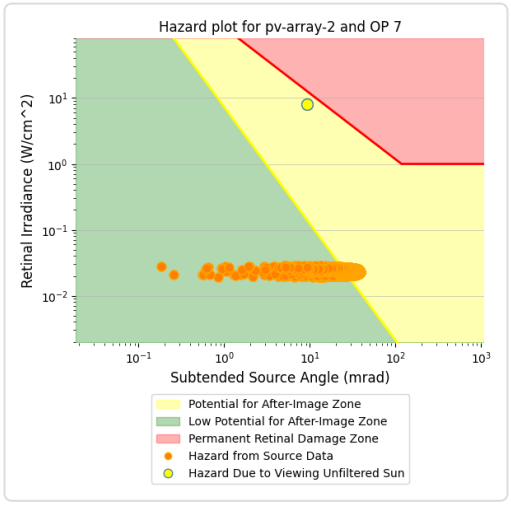
PV array 2 and OP 7

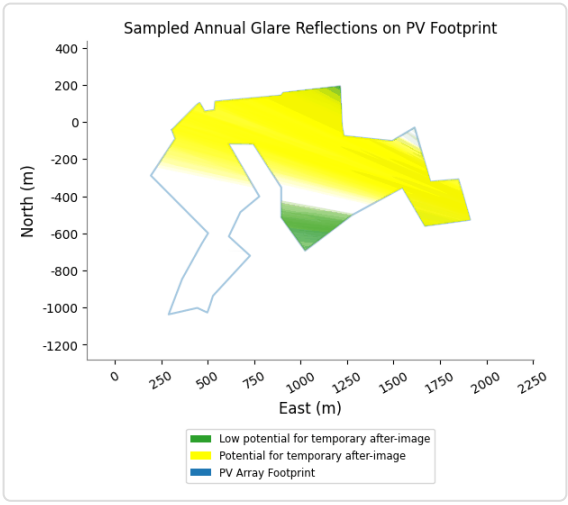
Yellow glare: 1,273 min.

Green glare: 1,149 min.





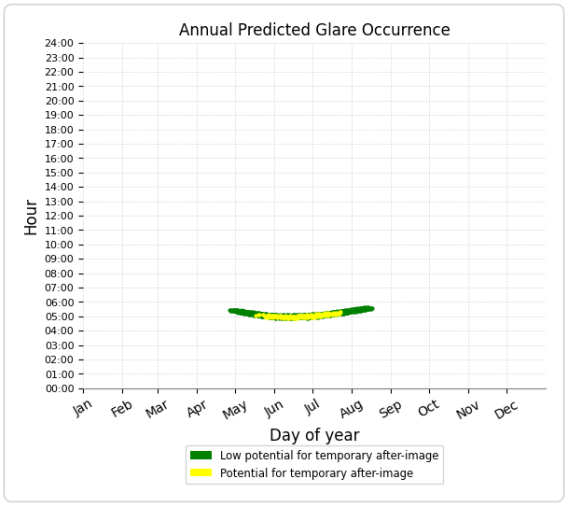


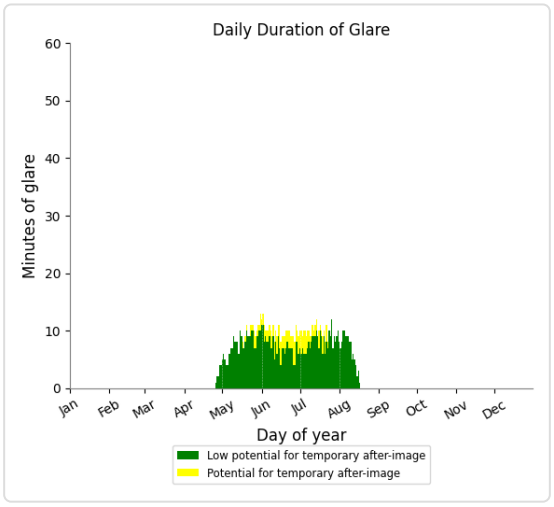


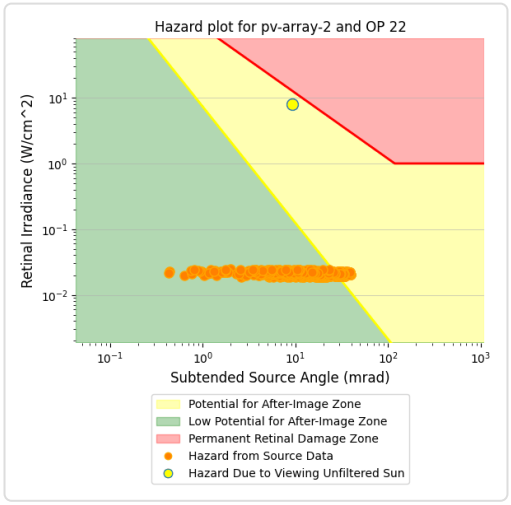
PV array 2 and OP 22

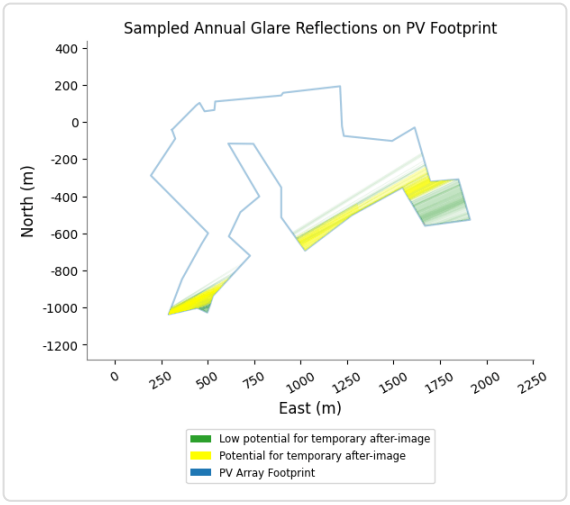
Yellow glare: 146 min.

Green glare: 833 min.





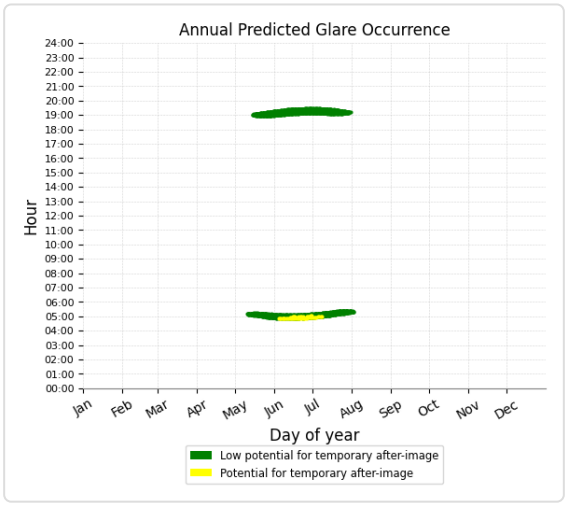


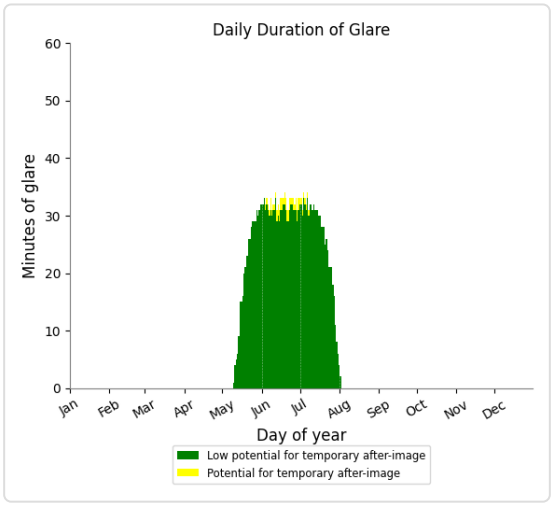


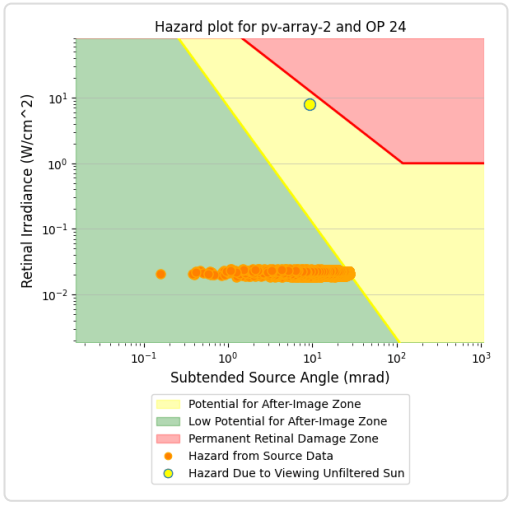
PV array 2 and OP 24

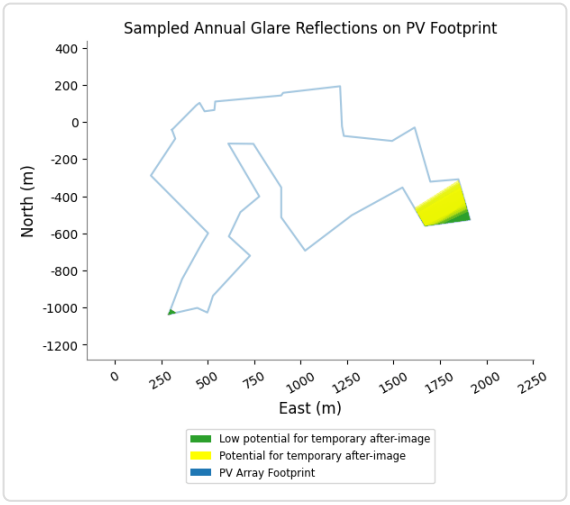
Yellow glare: 50 min.

Green glare: 2,197 min.





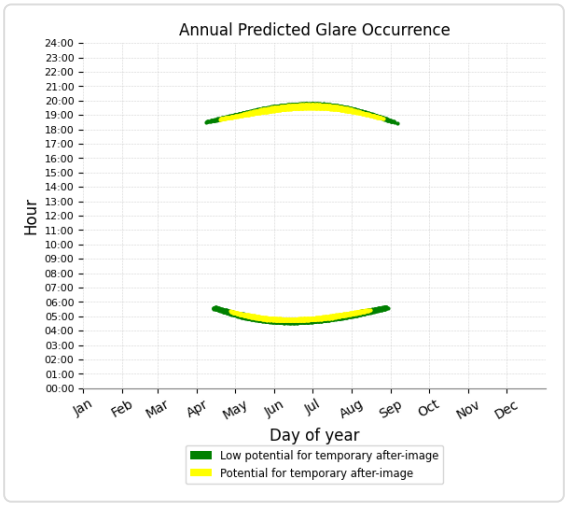


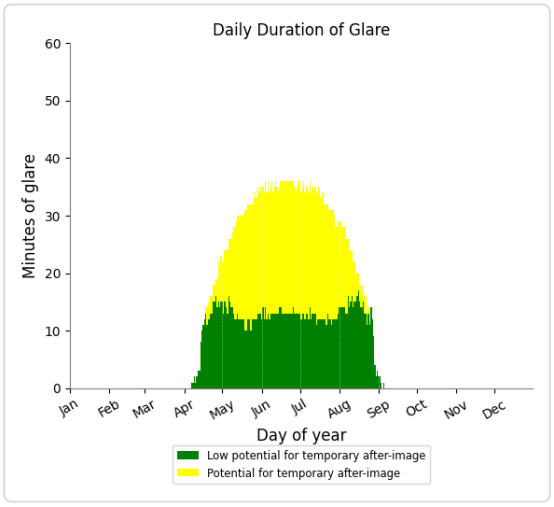


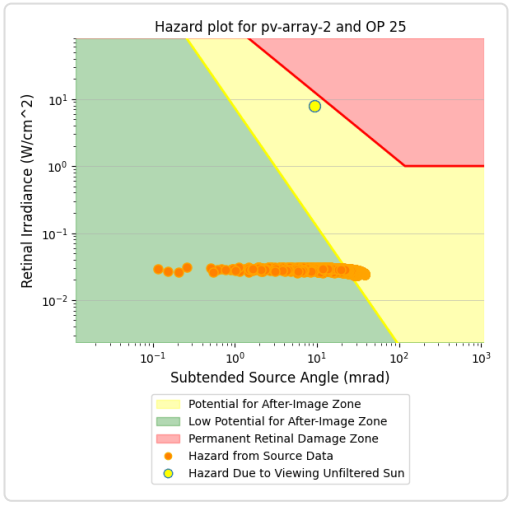
PV array 2 and OP 25

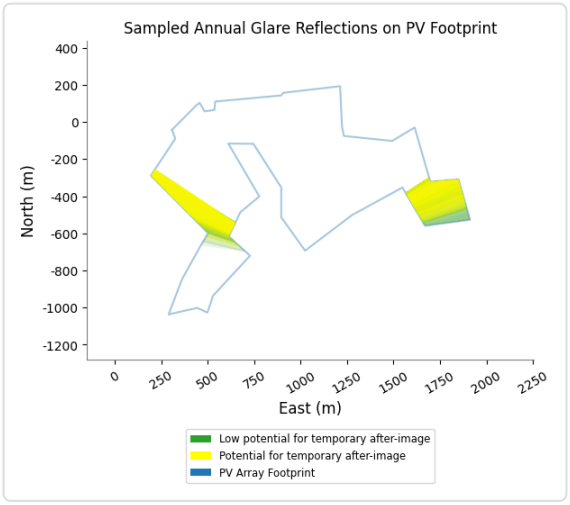
Yellow glare: 2,067 min.

Green glare: 1,797 min.





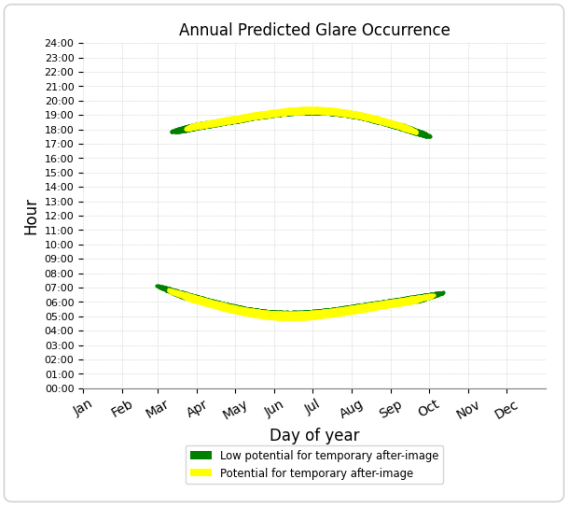


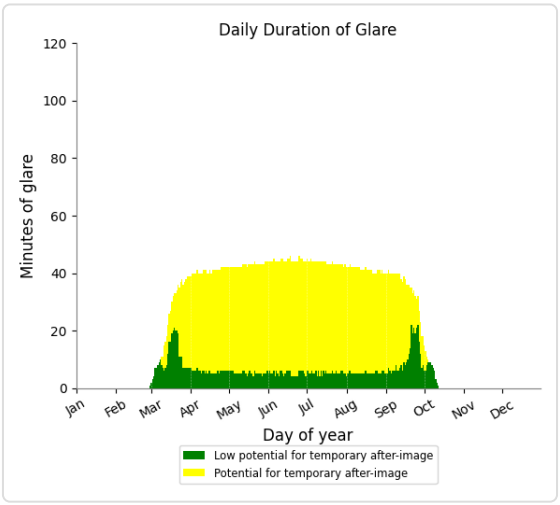


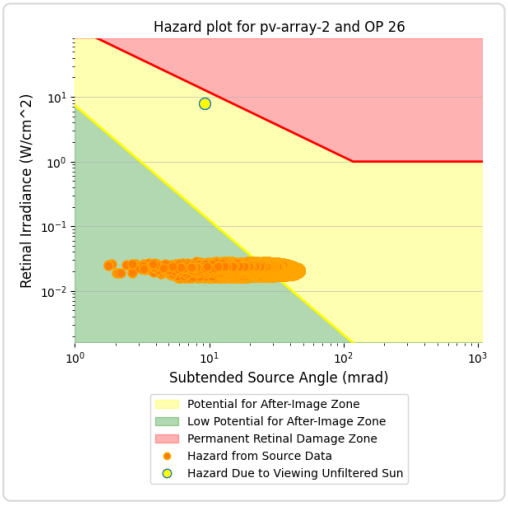
PV array 2 and OP 26

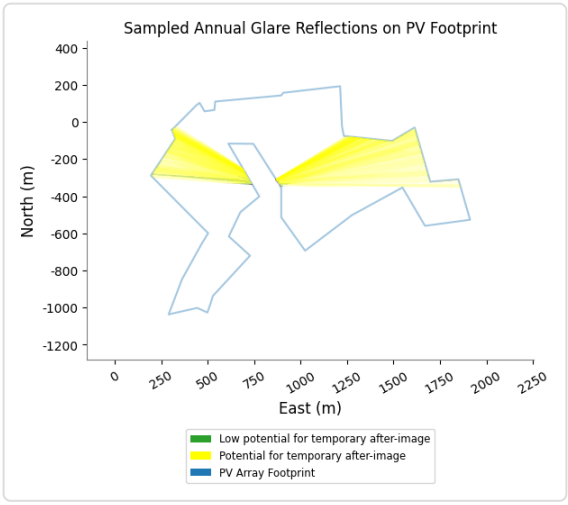
Yellow glare: 6,867 min.

Green glare: 1,527 min.





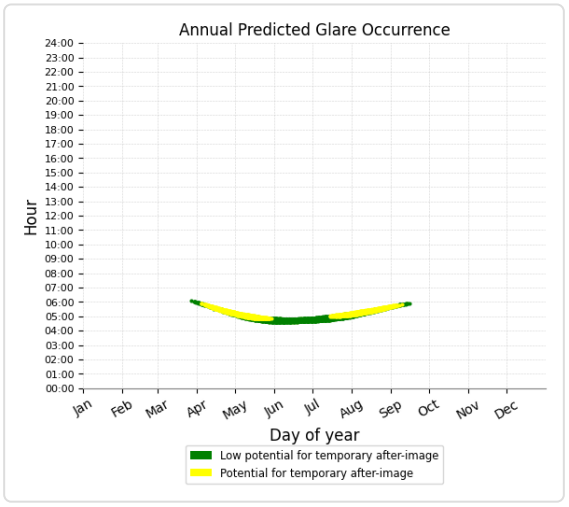


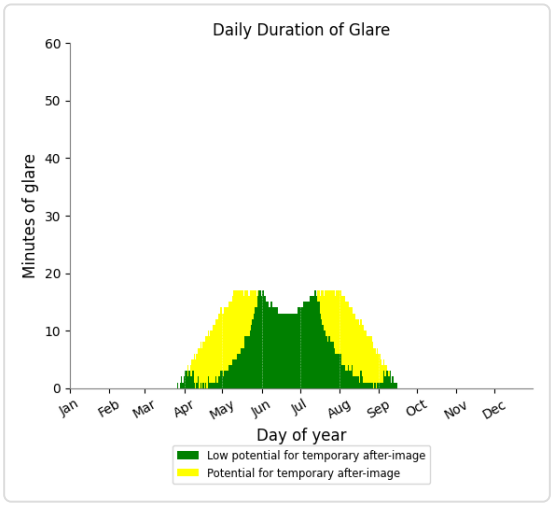


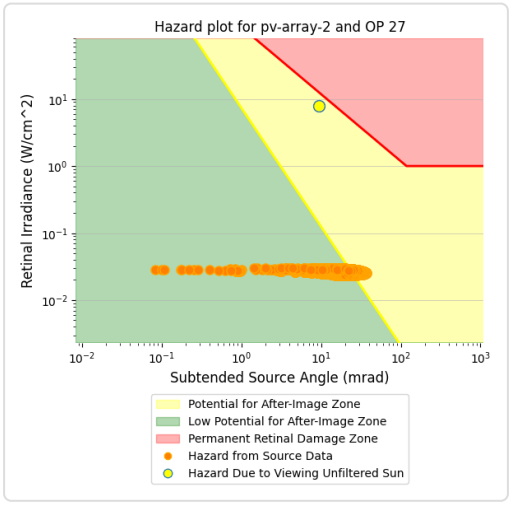
PV array 2 and OP 27

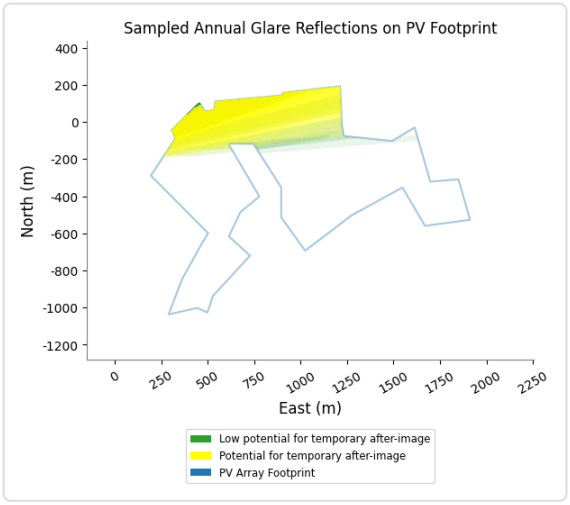
Yellow glare: 890 min.

Green glare: 1,182 min.





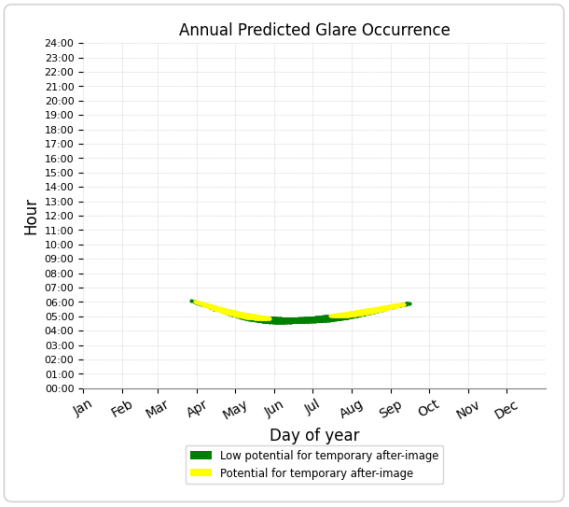


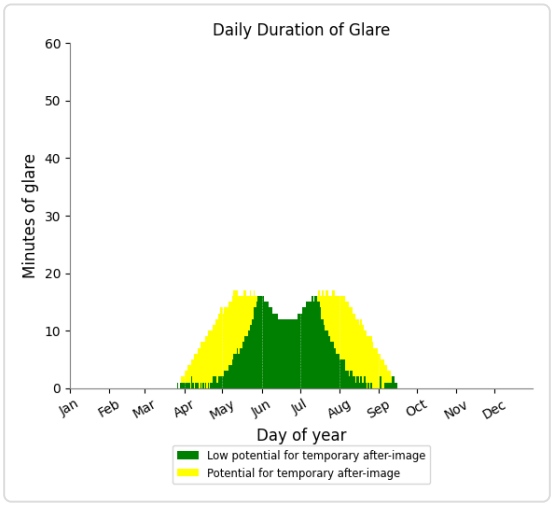


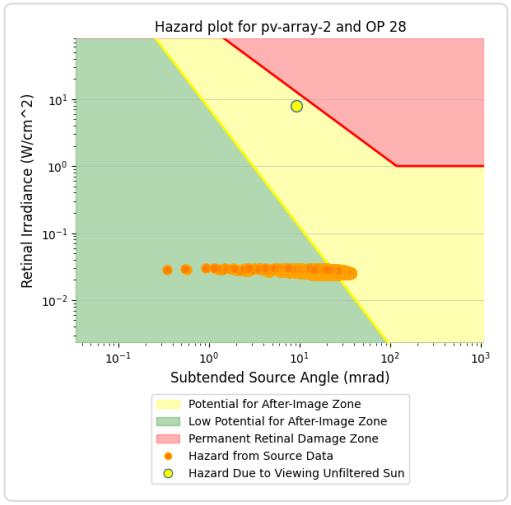
PV array 2 and OP 28

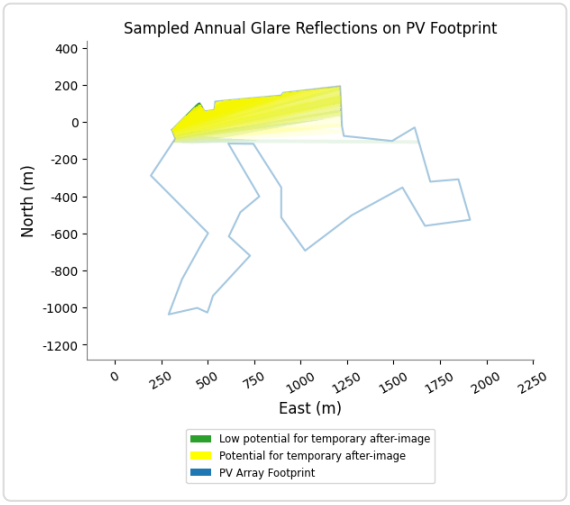
Yellow glare: 897 min.

Green glare: 1,130 min.





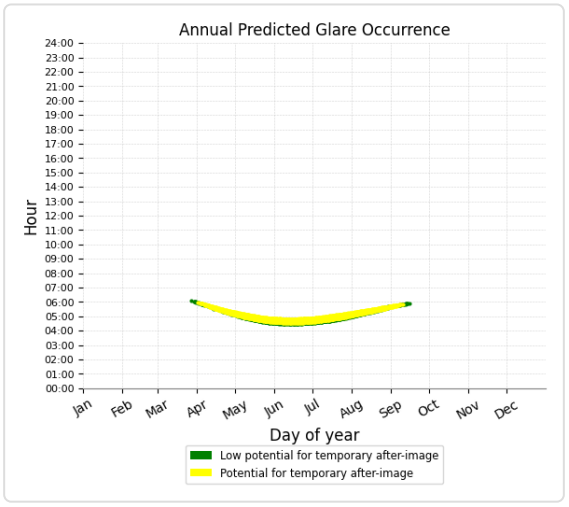


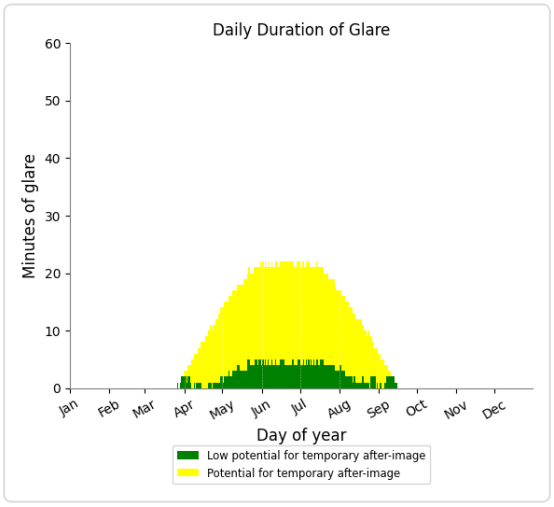


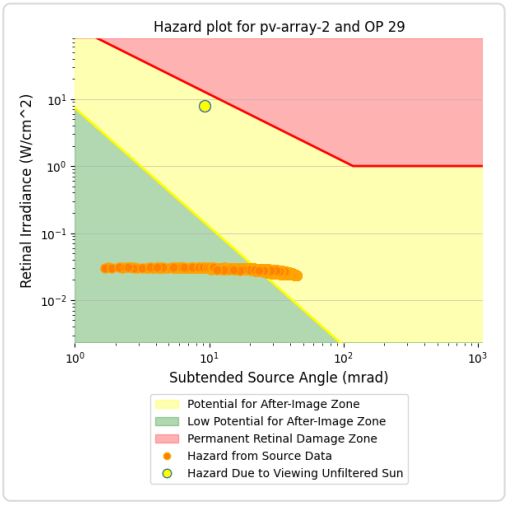
PV array 2 and OP 29

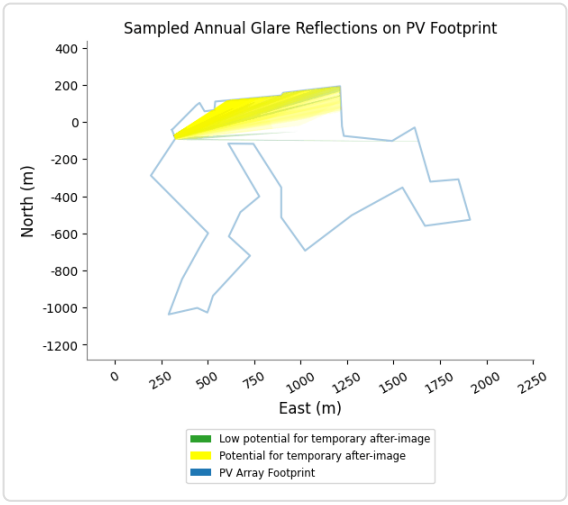
Yellow glare: 2,043 min.

Green glare: 471 min.





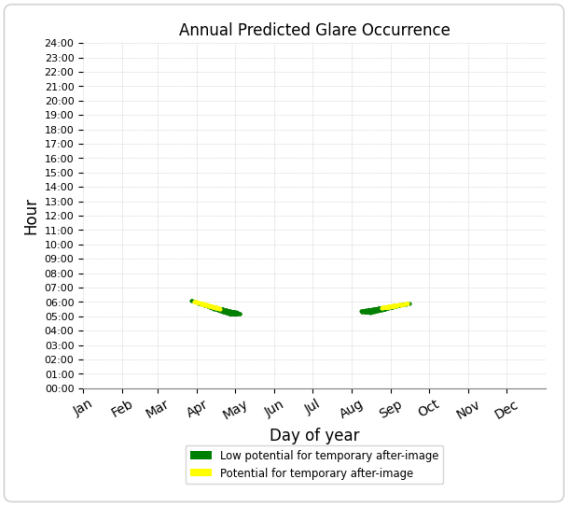


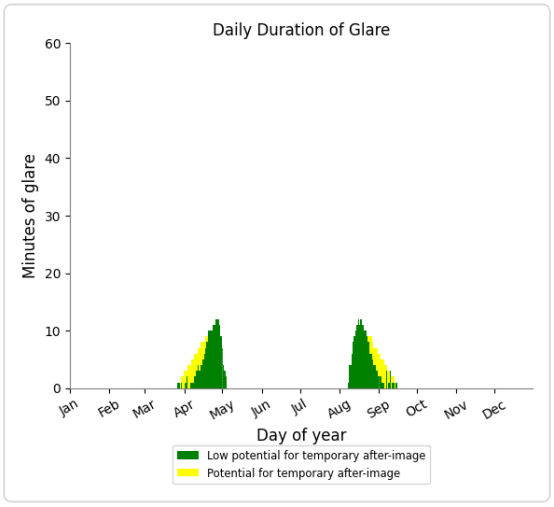


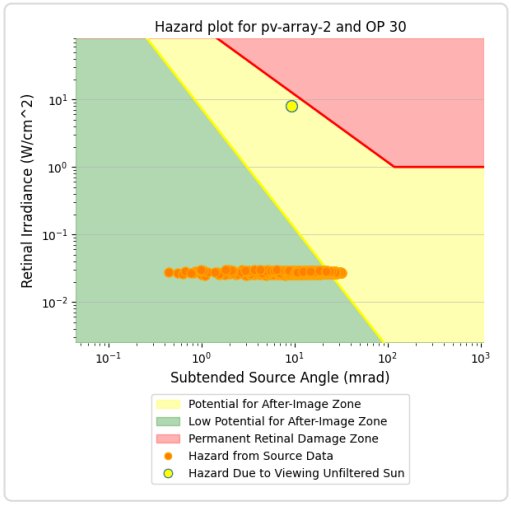
PV array 2 and OP 30

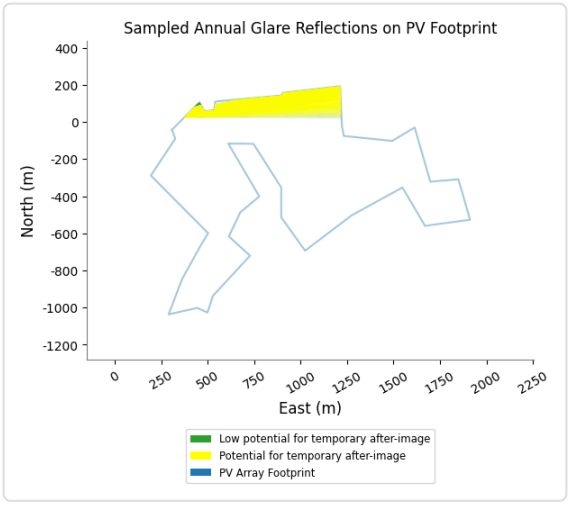
Yellow glare: 121 min.

Green glare: 387 min.





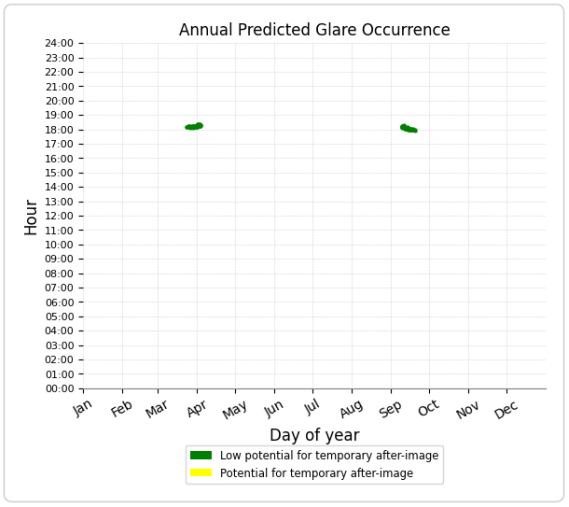


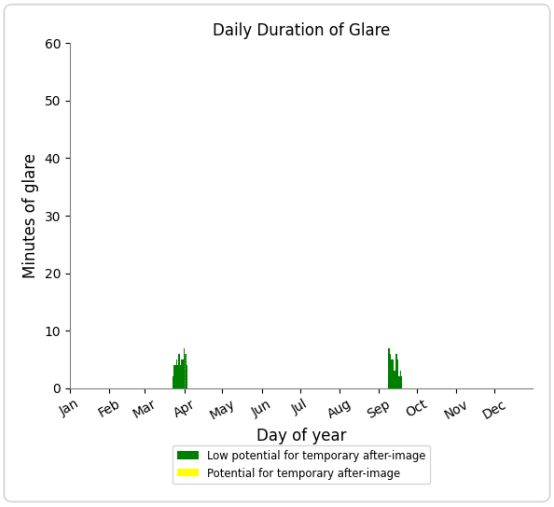


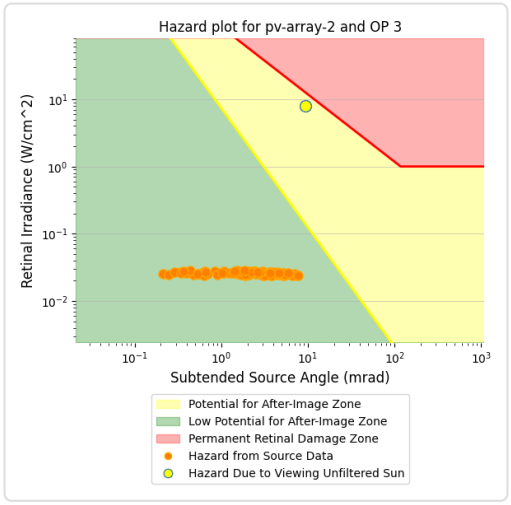
PV array 2 and OP 3

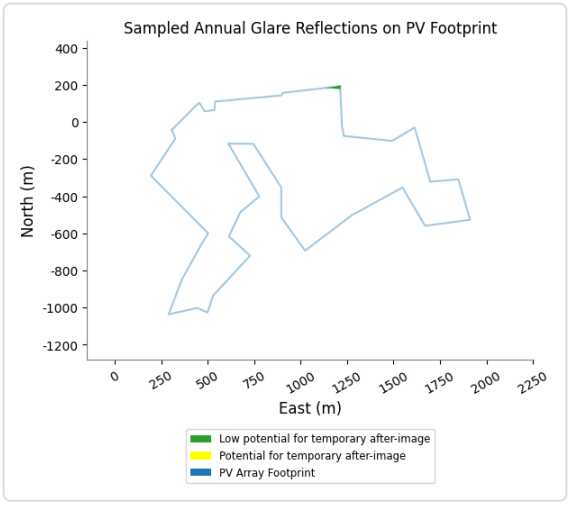
Yellow glare: none

Green glare: 103 min.





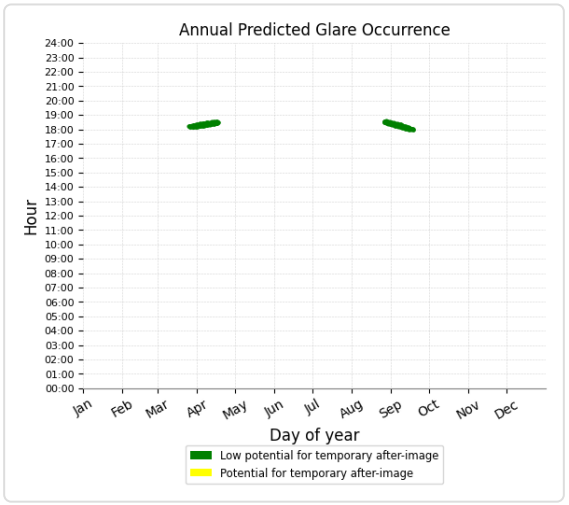


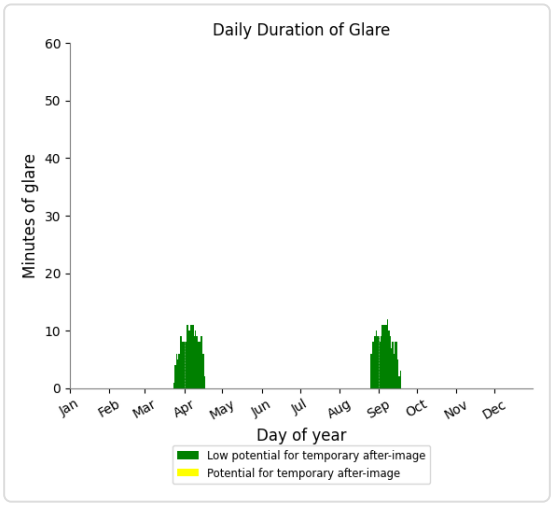


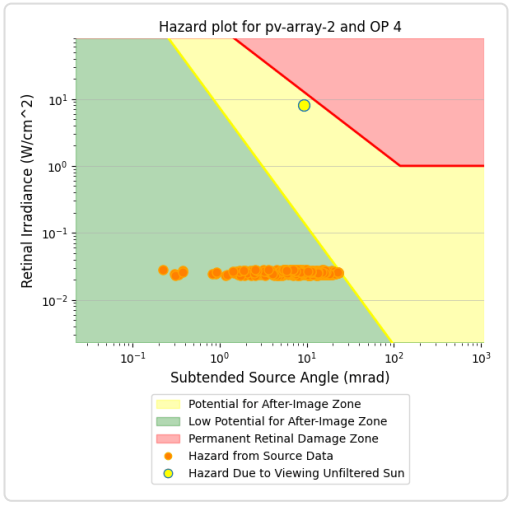
PV array 2 and OP 4

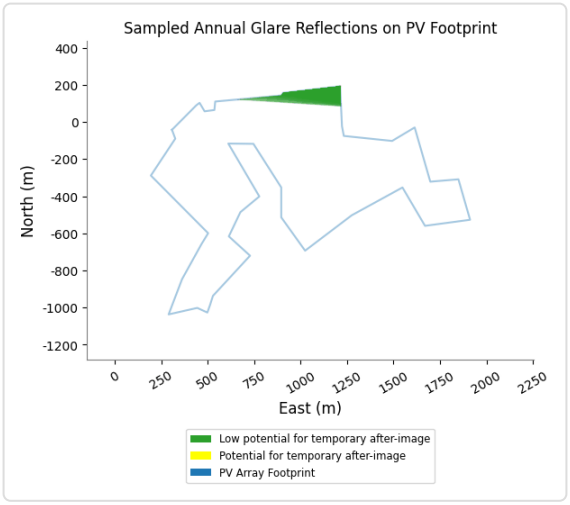
Yellow glare: none

Green glare: 397 min.





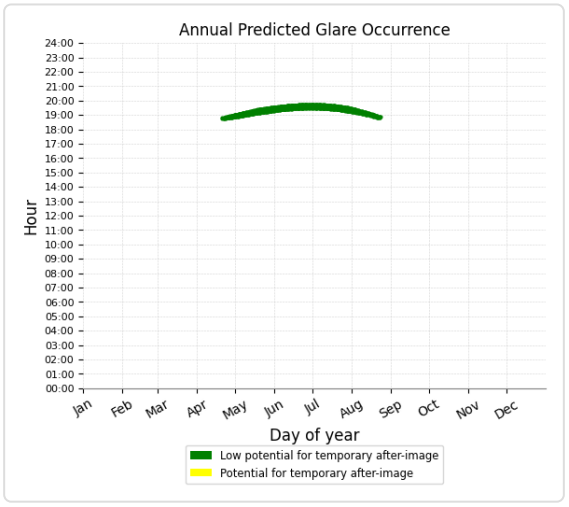


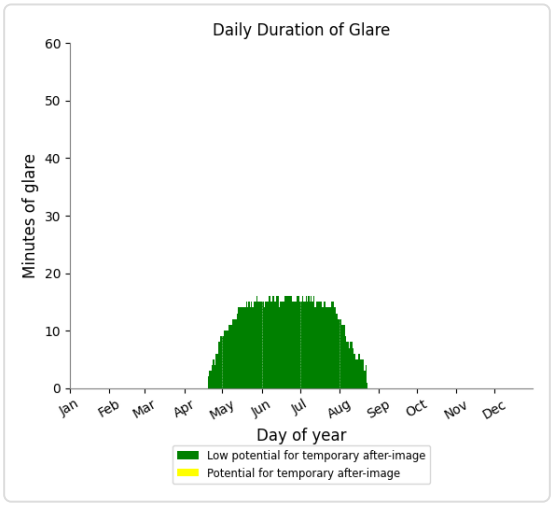


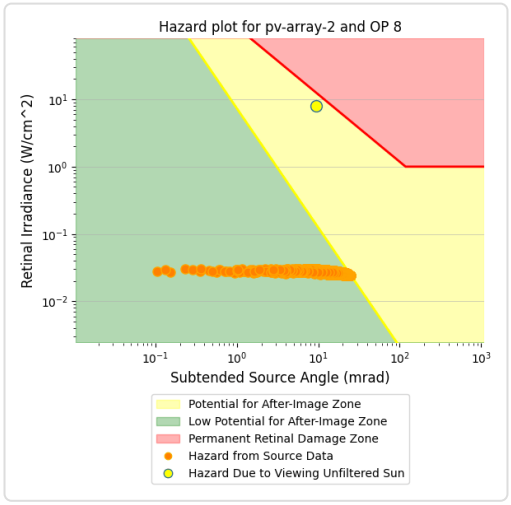
PV array 2 and OP 8

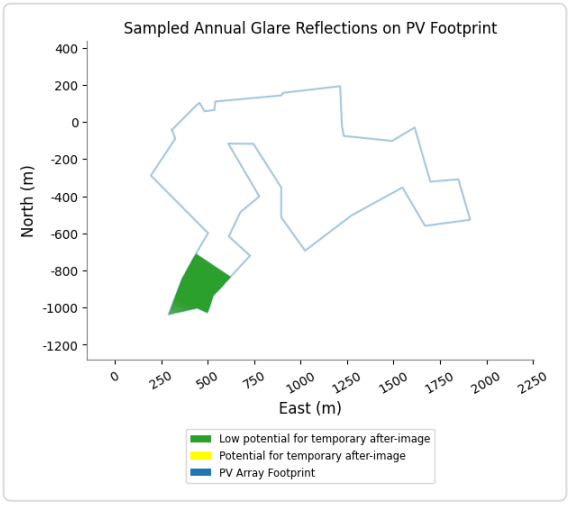
Yellow glare: none

Green glare: 1,542 min.





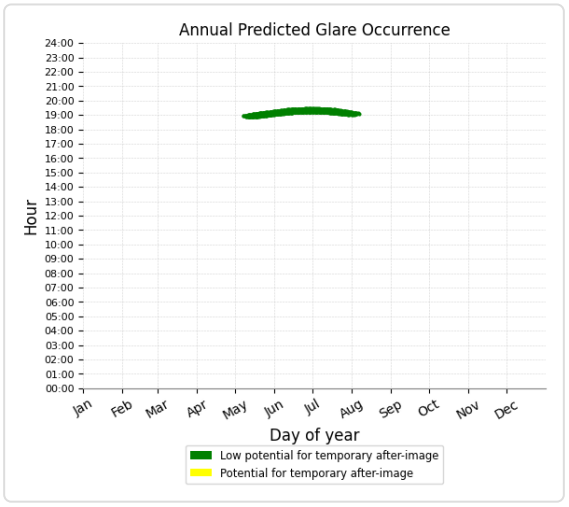


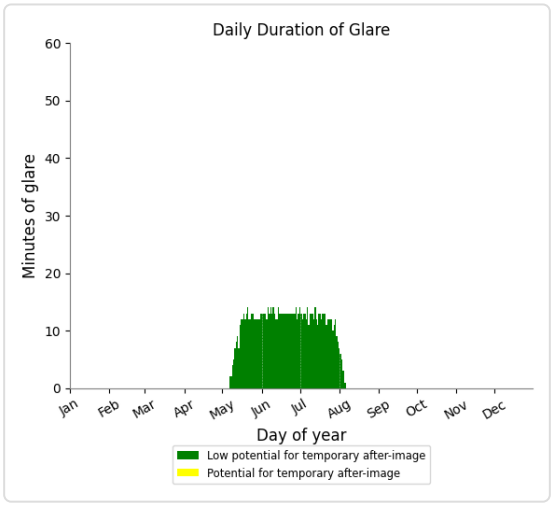


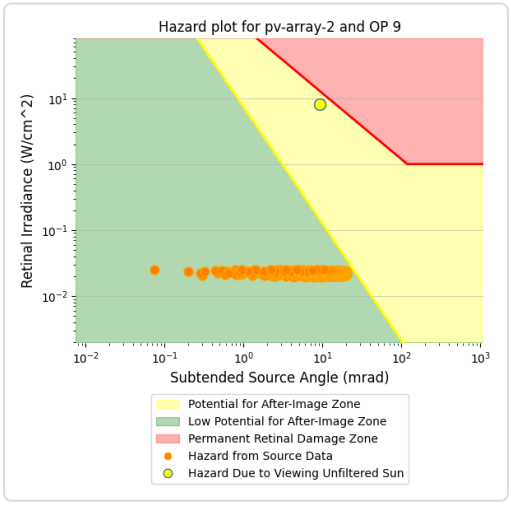
PV array 2 and OP 9

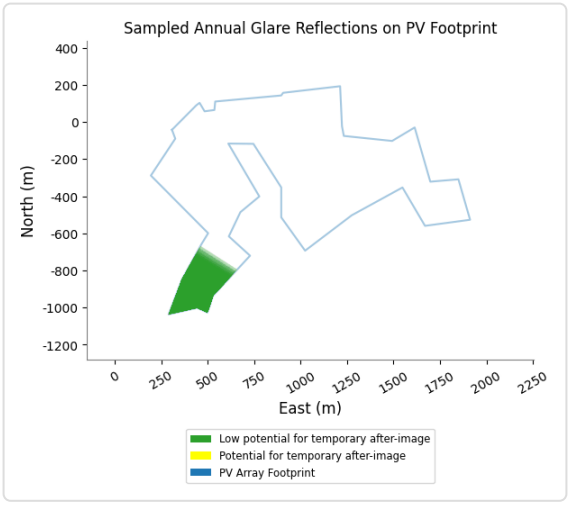
Yellow glare: none

Green glare: 1,044 min.





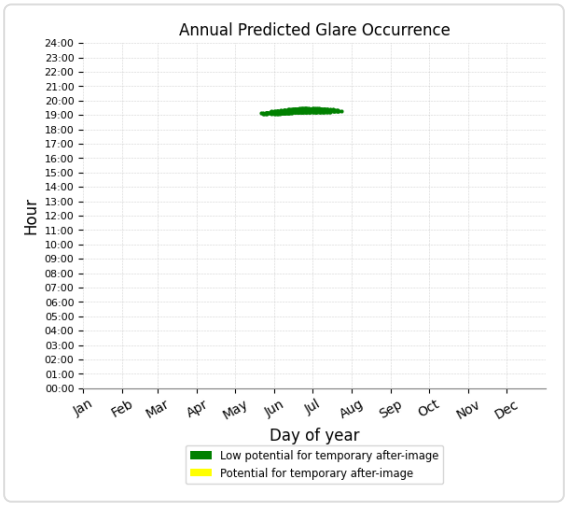


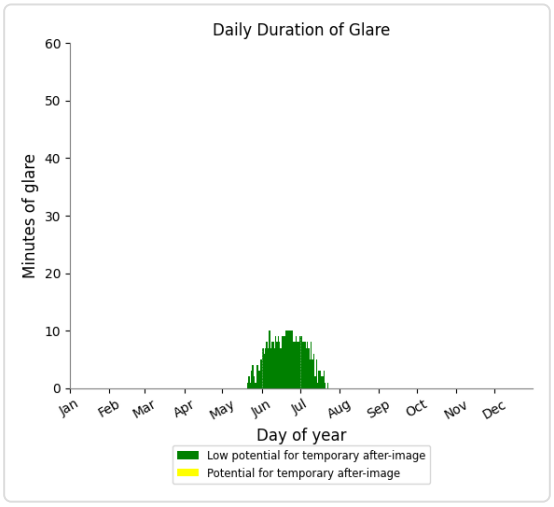


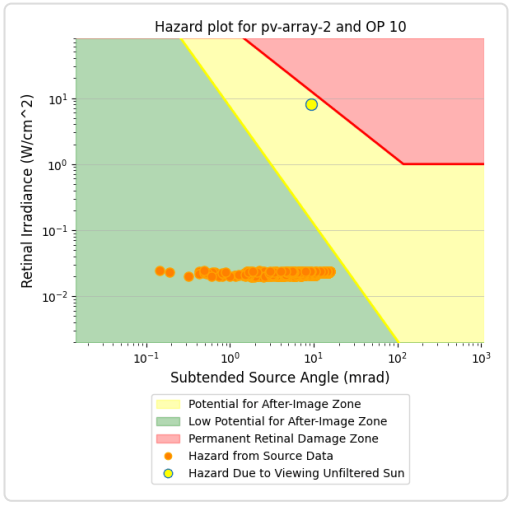
PV array 2 and OP 10

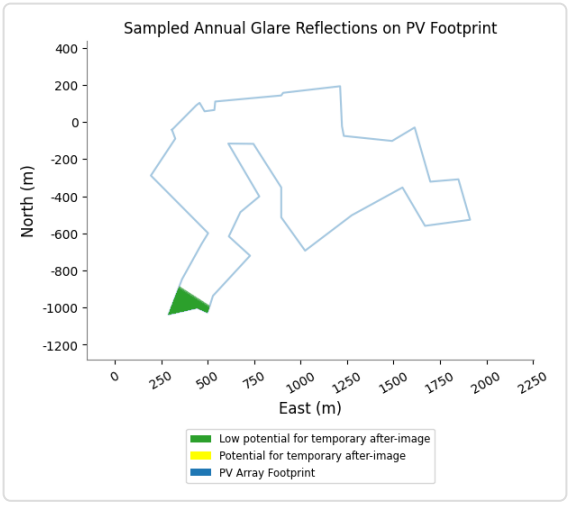
Yellow glare: none

Green glare: 390 min.





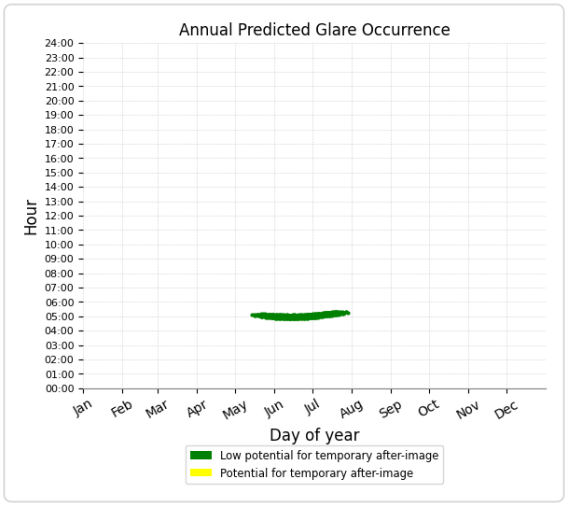


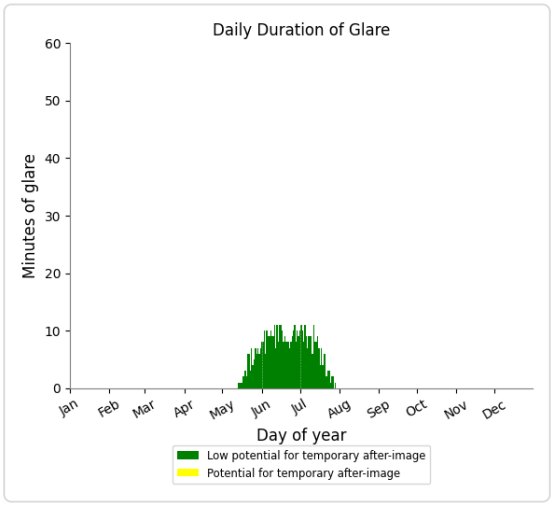


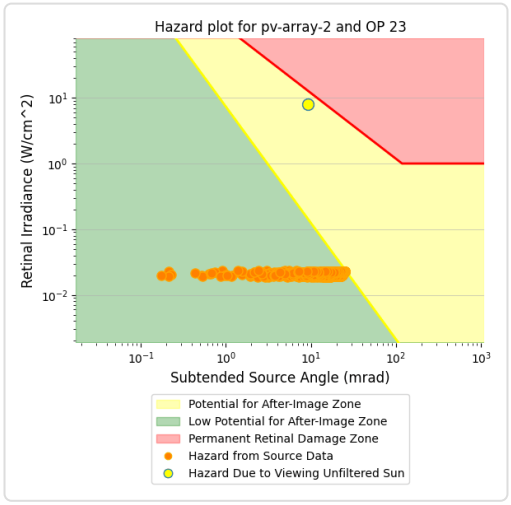
PV array 2 and OP 23

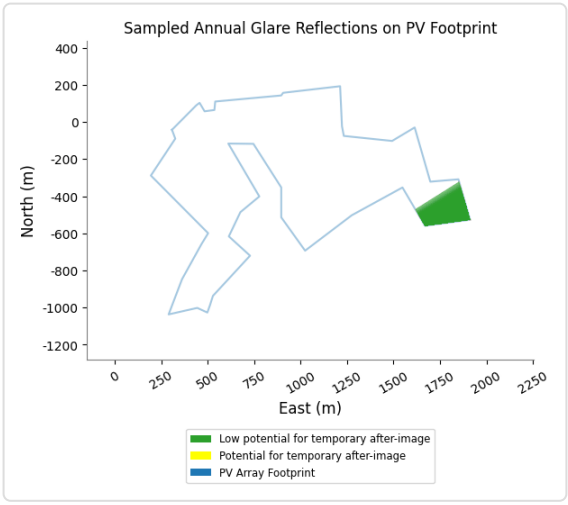
Yellow glare: none

Green glare: 529 min.









PV array 2 and OP 11

No glare found

PV array 2 and OP 12

No glare found

PV array 2 and OP 13

No glare found

PV array 2 and OP 14

No glare found

PV array 2 and OP 15

No glare found

PV array 2 and OP 16

No glare found

PV array 2 and OP 17

No glare found

PV array 2 and OP 18

No glare found

PV array 2 and OP 19

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 21

No glare found

PV: PV array 3 potential temporary after-image

Receptor results ordered by category of glare

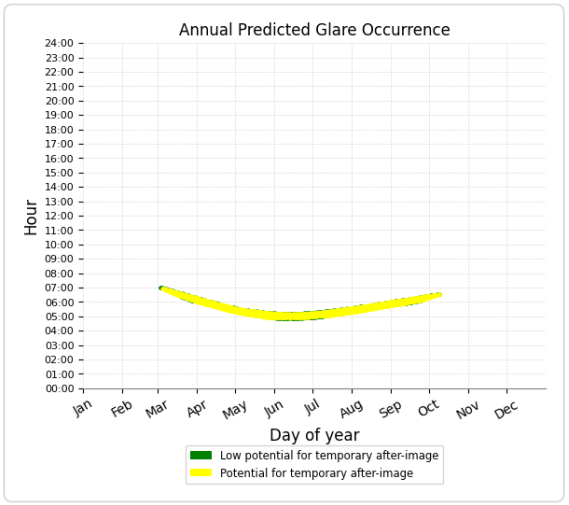
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1D	398	6.6	3,239	54.0
PRoW 2D	639	10.7	854	14.2
PRoW 3D	711	11.8	310	5.2
Route 4D	2,204	36.7	851	14.2
Route 5D	378	6.3	2,067	34.5
PRoW 4D	0	0.0	0	0.0
Route 1D	0	0.0	0	0.0
Route 2D	0	0.0	0	0.0
Route 3D	0	0.0	0	0.0
Route 6D	0	0.0	0	0.0
OP 8	997	16.6	258	4.3
OP 9	1,327	22.1	866	14.4
OP 10	636	10.6	1,885	31.4
OP 12	929	15.5	395	6.6
OP 18	821	13.7	1,359	22.6
OP 19	1,586	26.4	4,268	71.1
OP 20	1,192	19.9	1,944	32.4
OP 21	894	14.9	129	2.1
OP 23	977	16.3	689	11.5
OP 24	1,083	18.1	413	6.9
OP 22	771	12.8	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

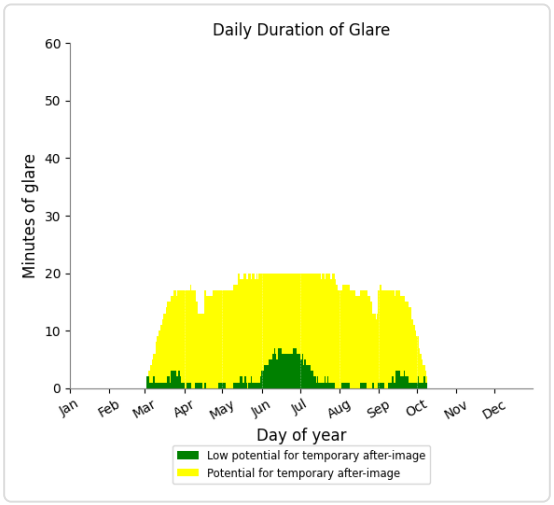
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 30	0	0.0	0	0.0

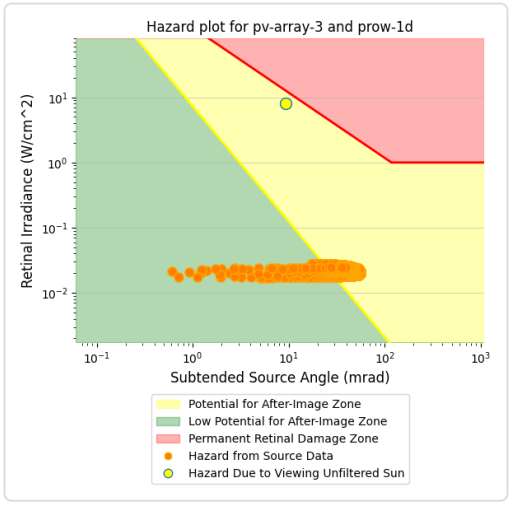
PV array 3 and Route: PRoW 1D

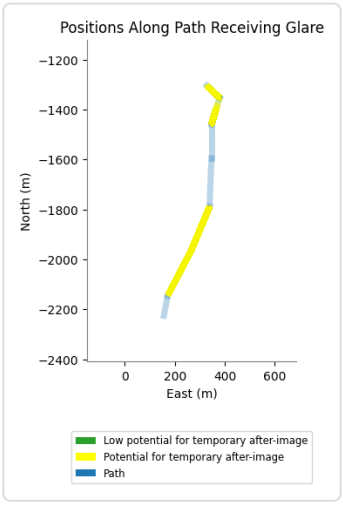
Yellow glare: 3,239 min.

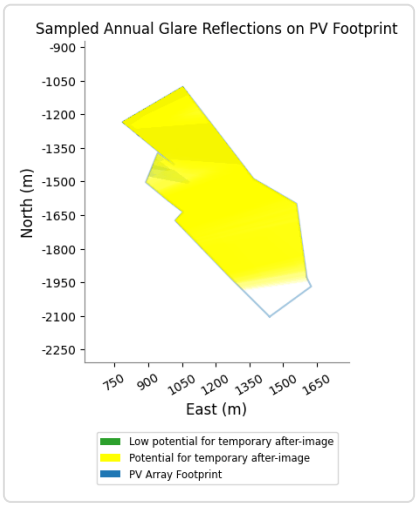
Green glare: 398 min.







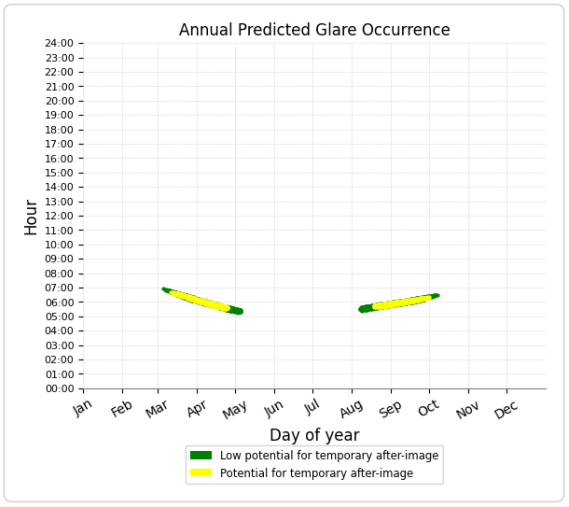


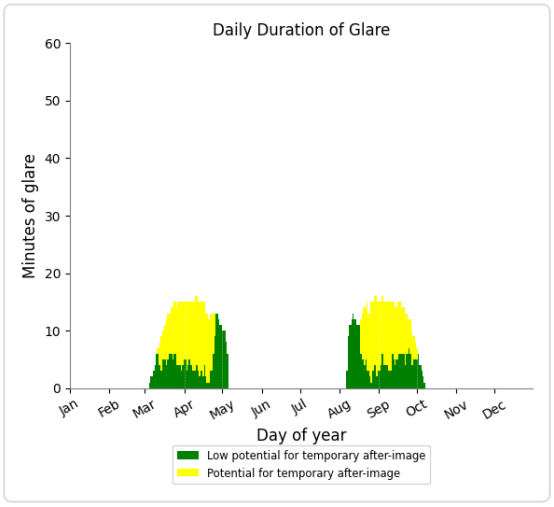


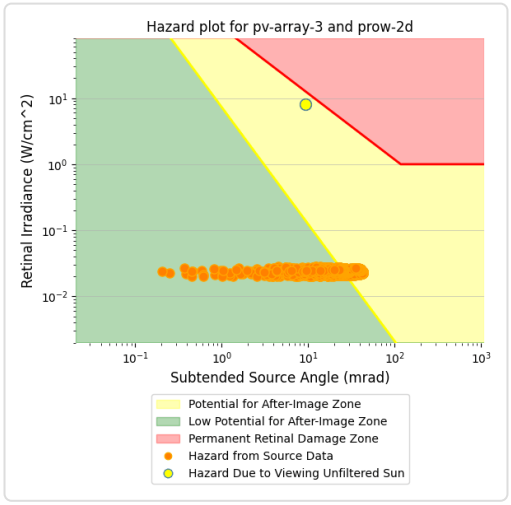
PV array 3 and Route: PRoW 2D

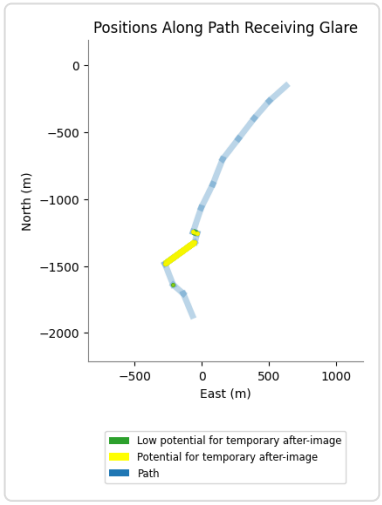
Yellow glare: 854 min.

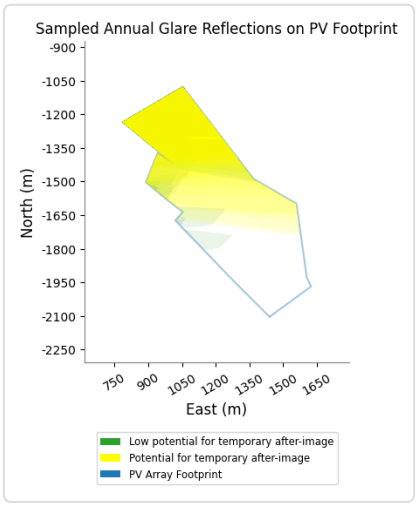
Green glare: 639 min.







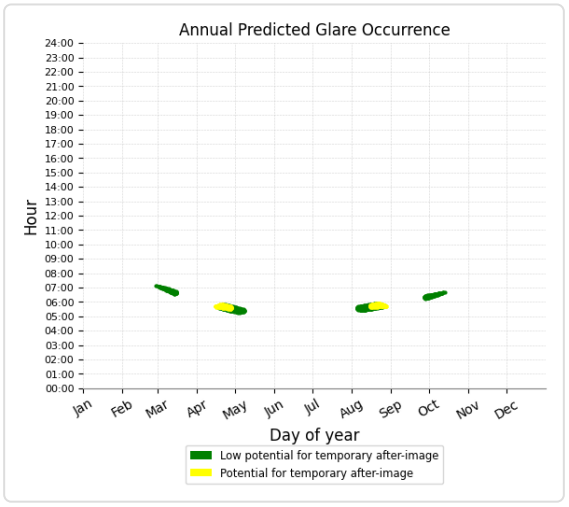


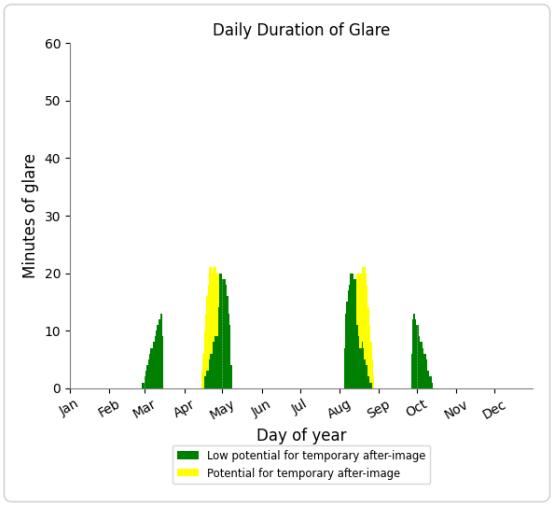


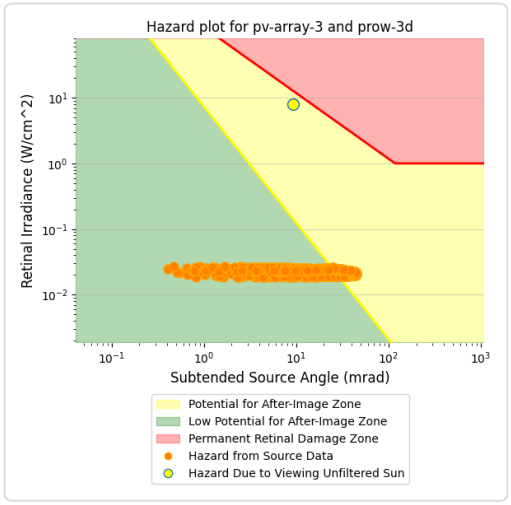
PV array 3 and Route: PRoW 3D

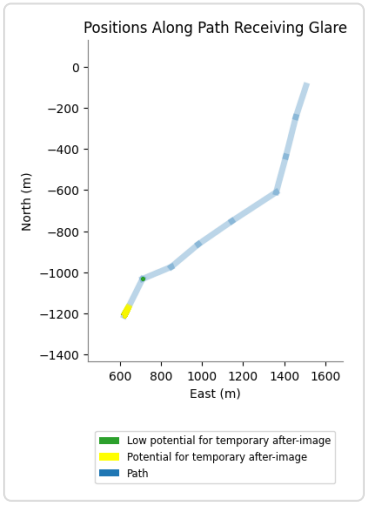
Yellow glare: 310 min.

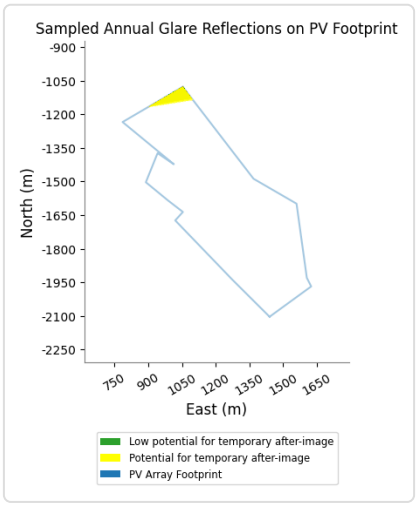
Green glare: 711 min.







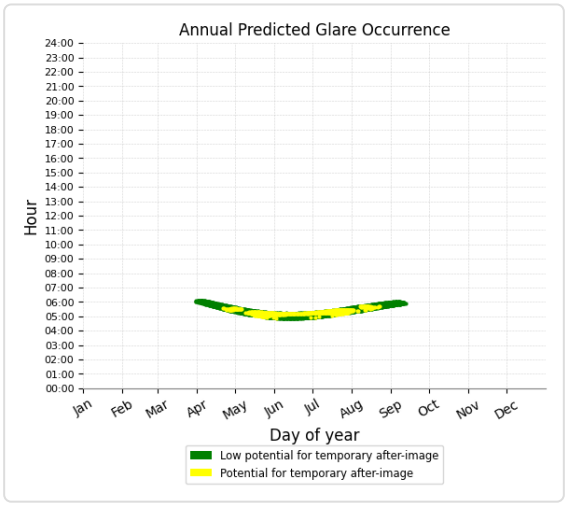


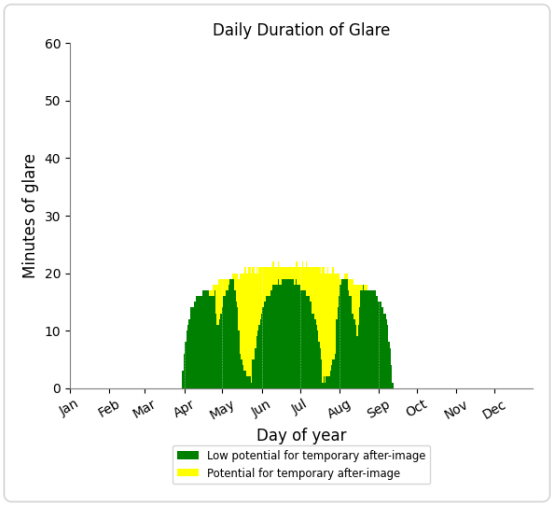


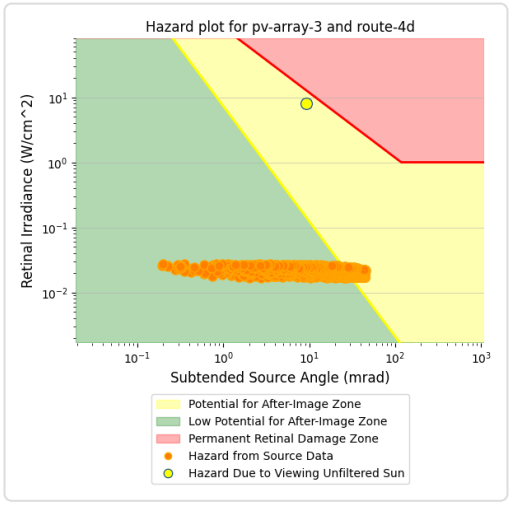
PV array 3 and Route: Route 4D

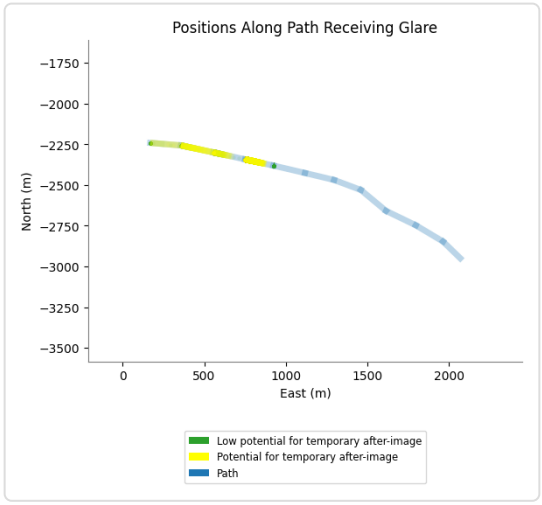
Yellow glare: 851 min.

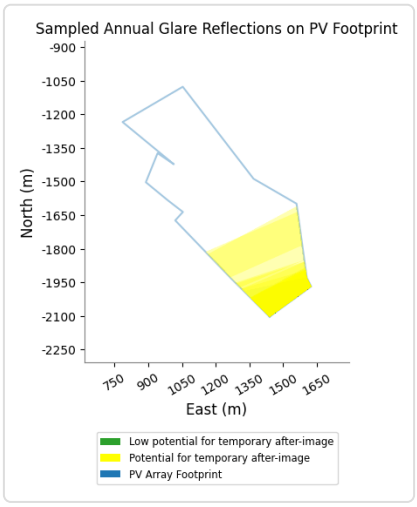
Green glare: 2,204 min.







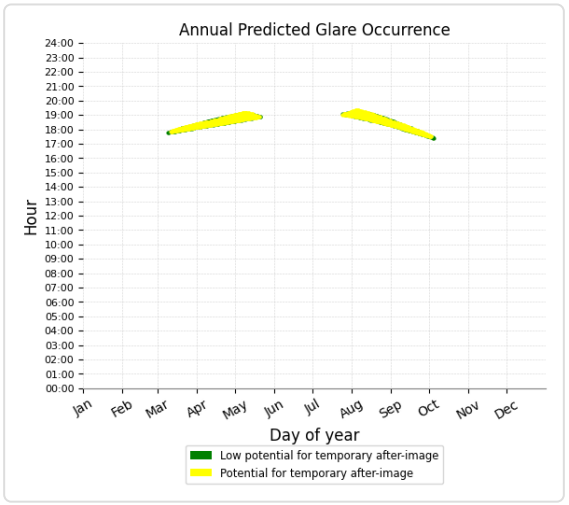


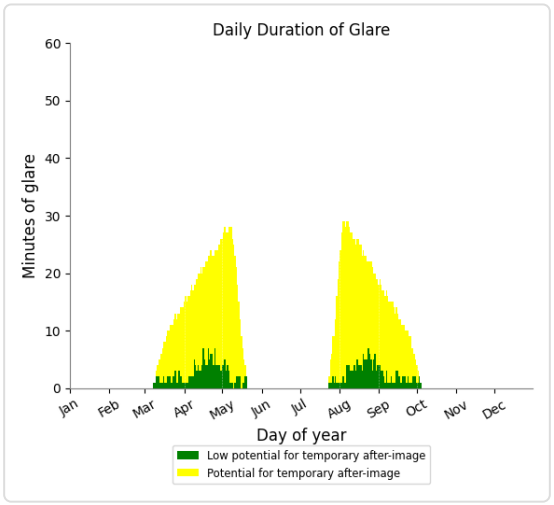


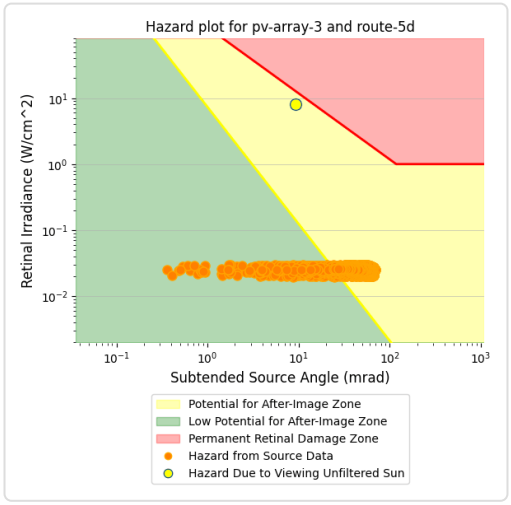
PV array 3 and Route: Route 5D

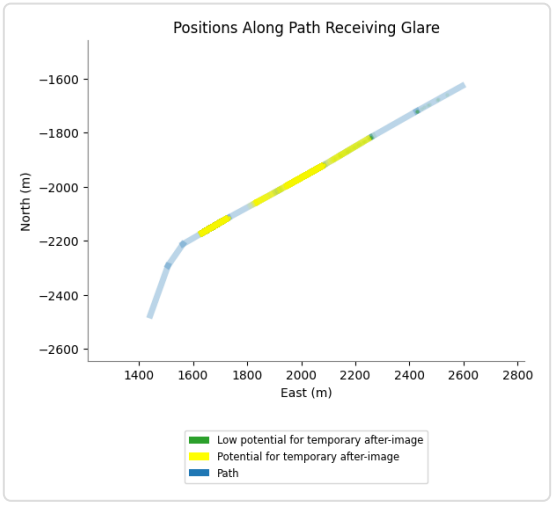
Yellow glare: 2,067 min.

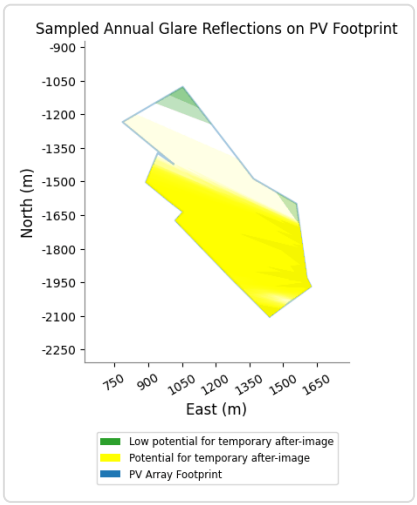
Green glare: 378 min.











PV array 3 and Route: PRoW 4D

No glare found

PV array 3 and Route: Route 1D

No glare found

PV array 3 and Route: Route 2D

No glare found

PV array 3 and Route: Route 3D

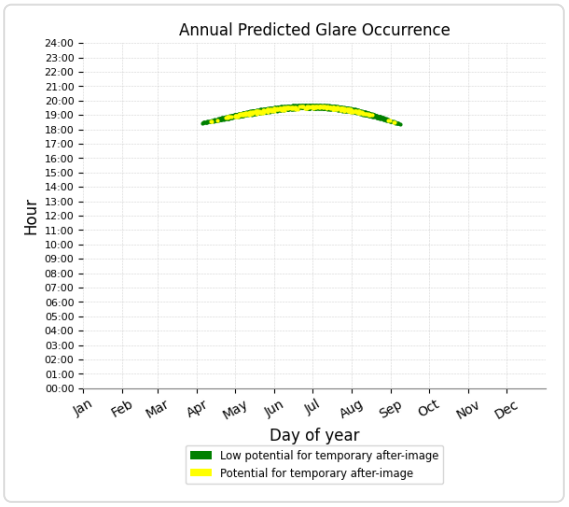
No glare found

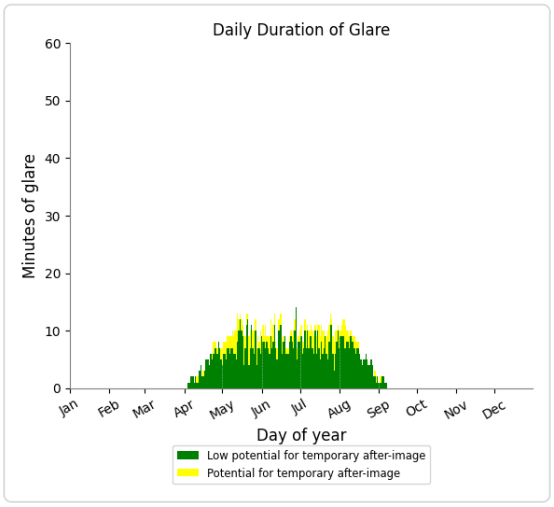
PV array 3 and Route: Route 6D

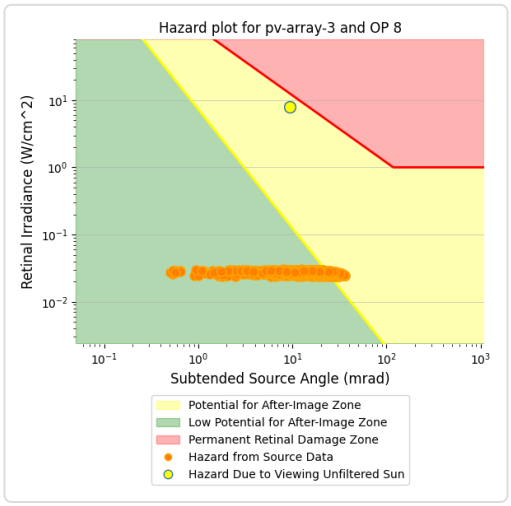
No glare found

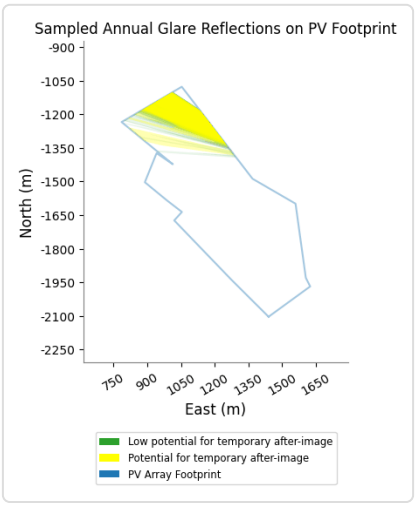
PV array 3 and OP 8

Yellow glare: 258 min.
Green glare: 997 min.





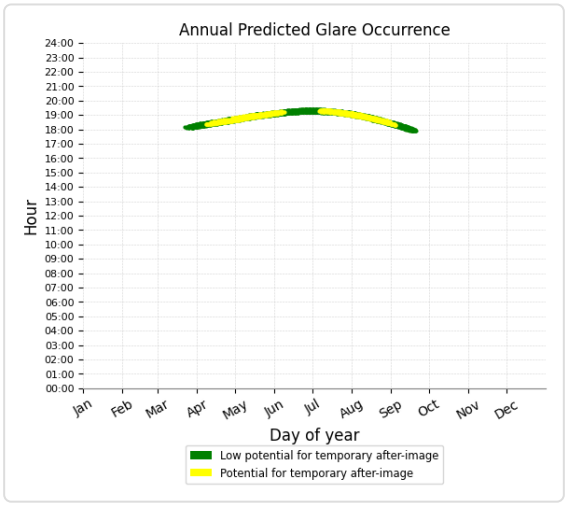


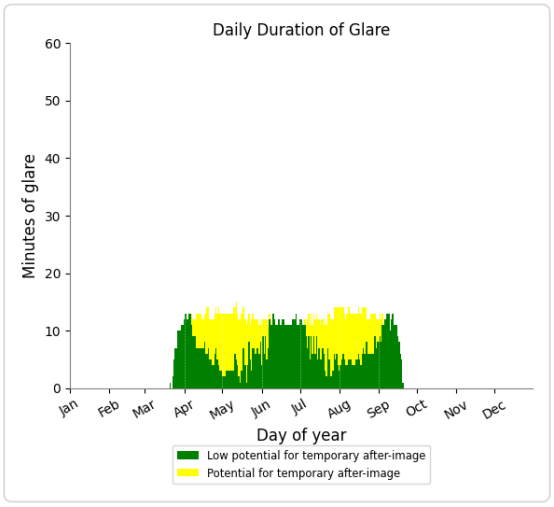


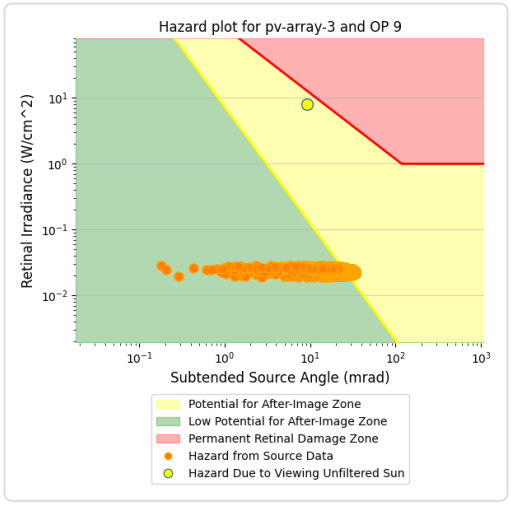
PV array 3 and OP 9

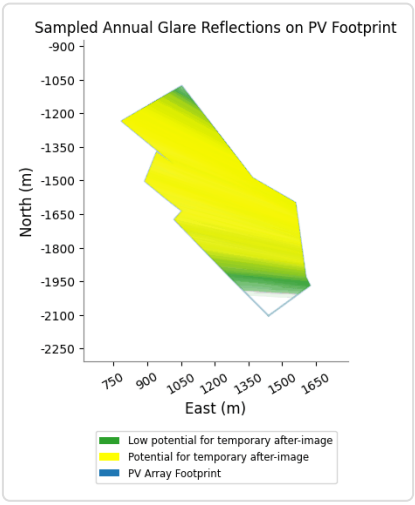
Yellow glare: 866 min.

Green glare: 1,327 min.





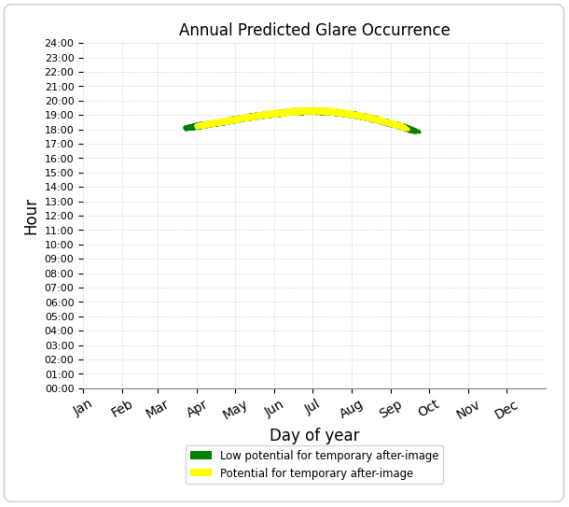


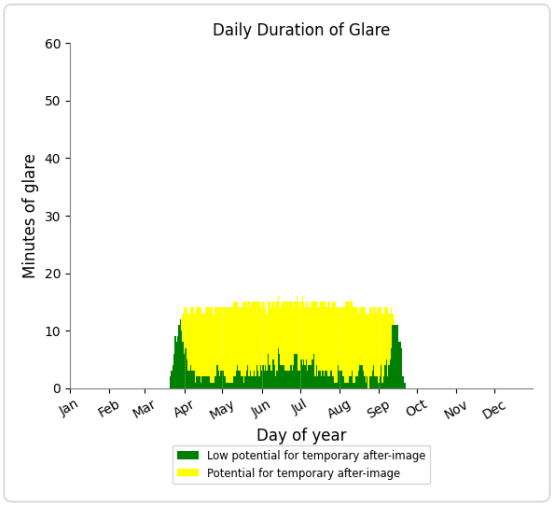


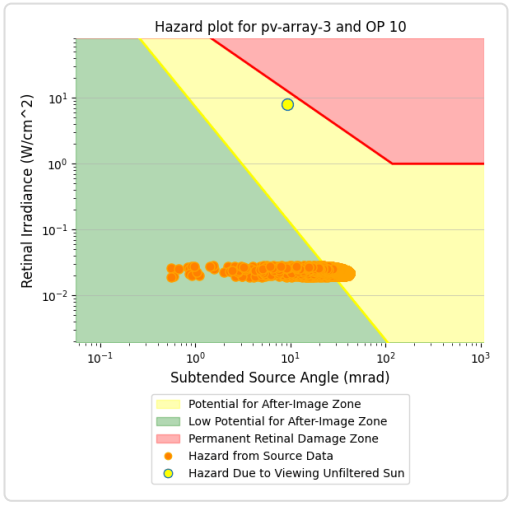
PV array 3 and OP 10

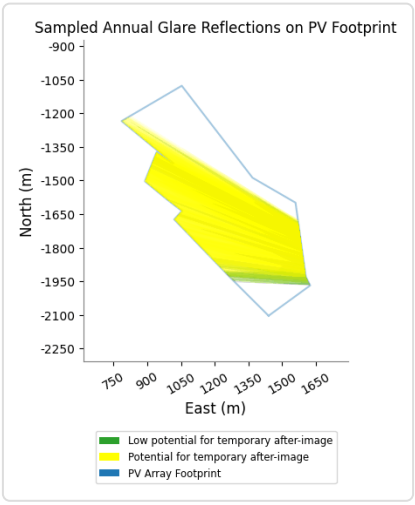
Yellow glare: 1,885 min.

Green glare: 636 min.





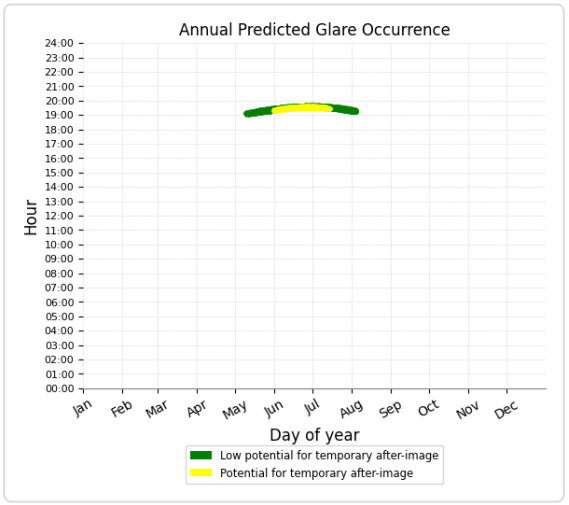


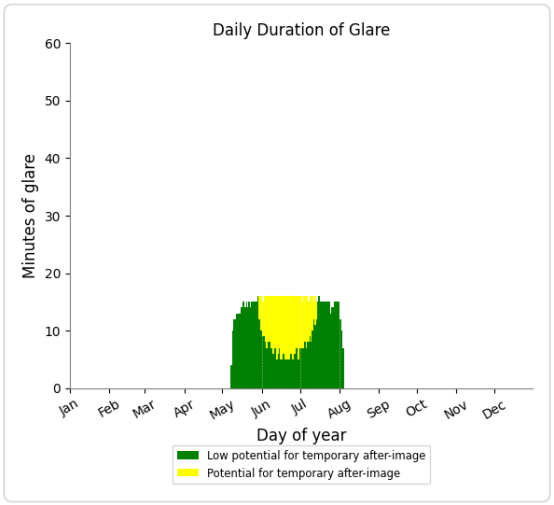


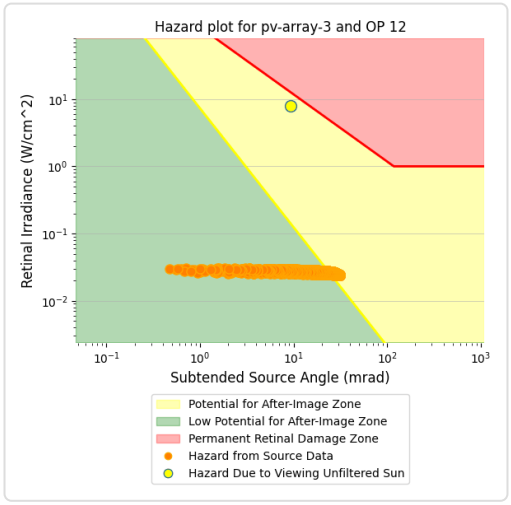
PV array 3 and OP 12

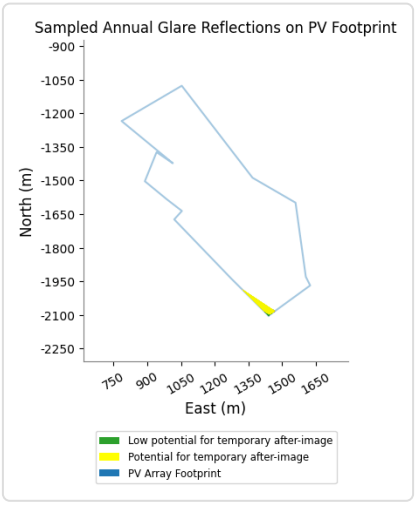
Yellow glare: 395 min.

Green glare: 929 min.





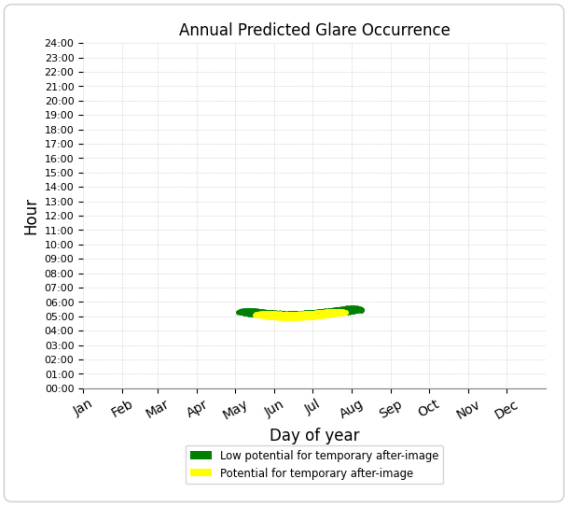


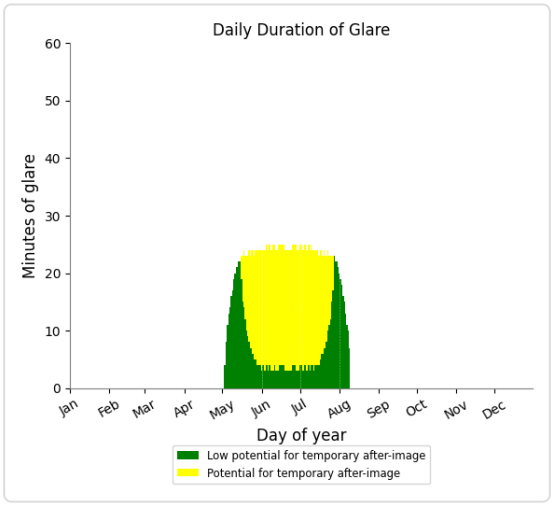


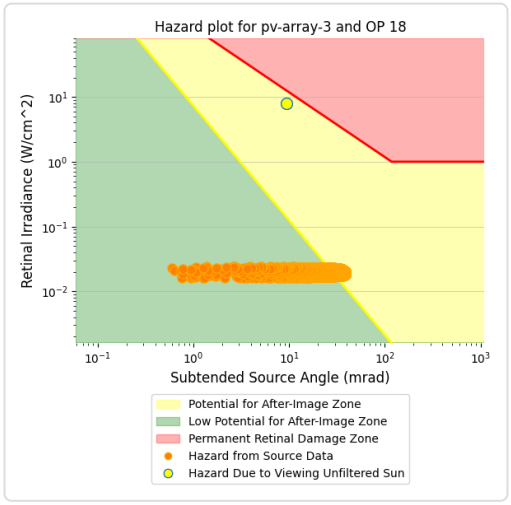
PV array 3 and OP 18

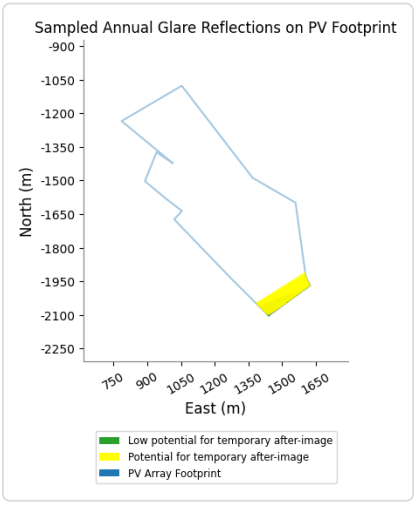
Yellow glare: 1,359 min.

Green glare: 821 min.





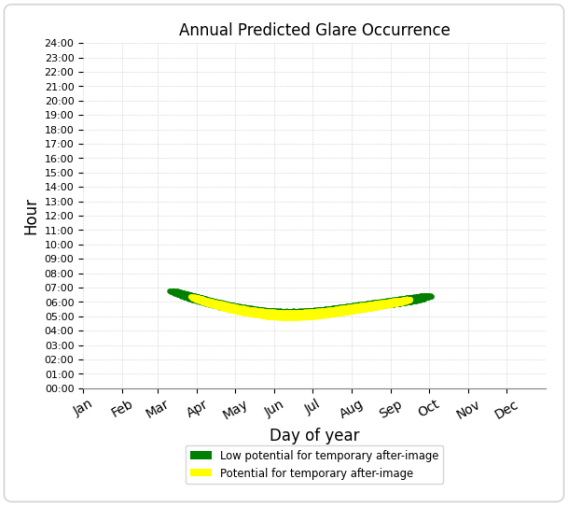


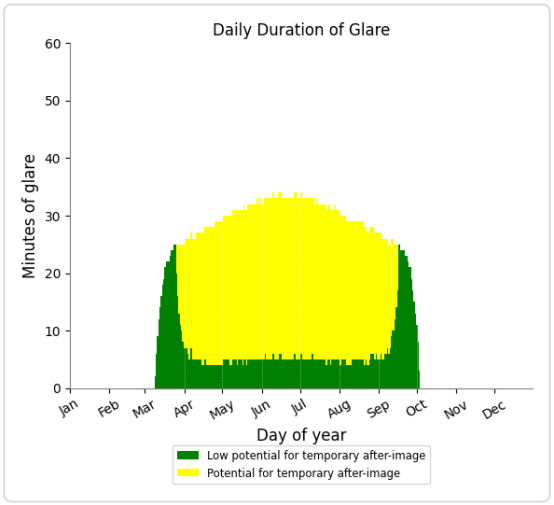


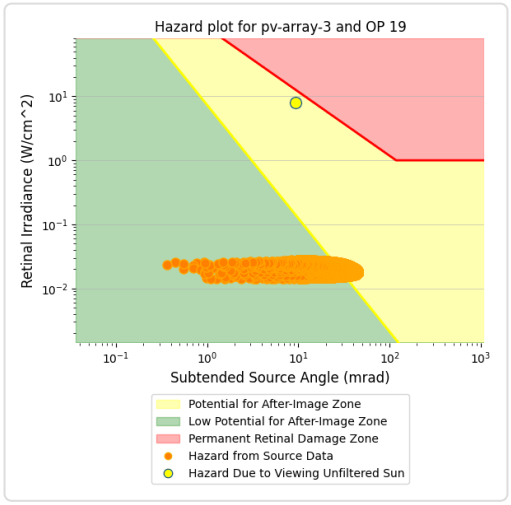
PV array 3 and OP 19

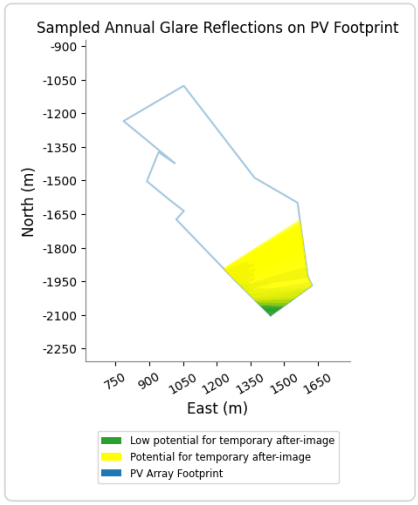
Yellow glare: 4,268 min.

Green glare: 1,586 min.





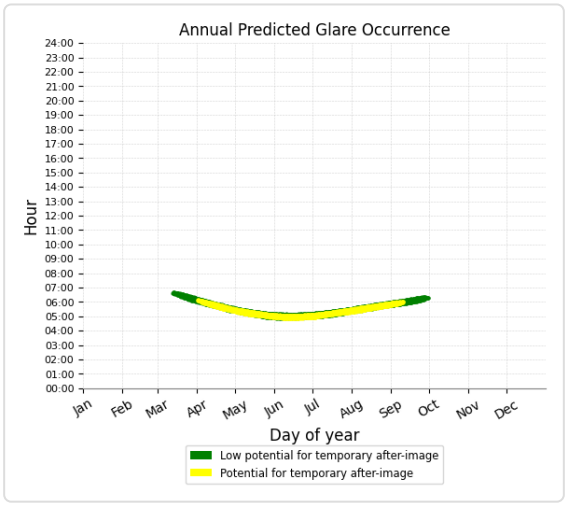


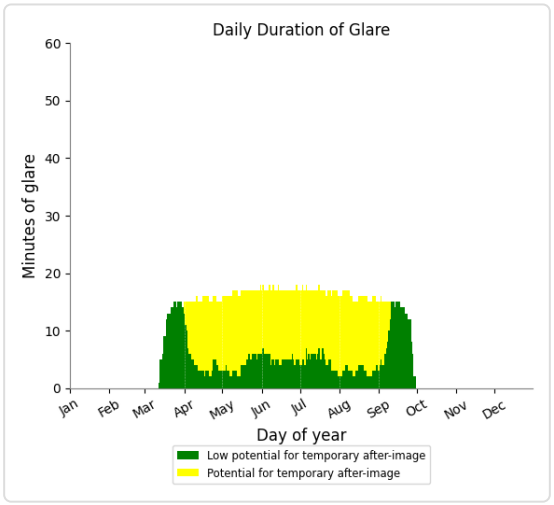


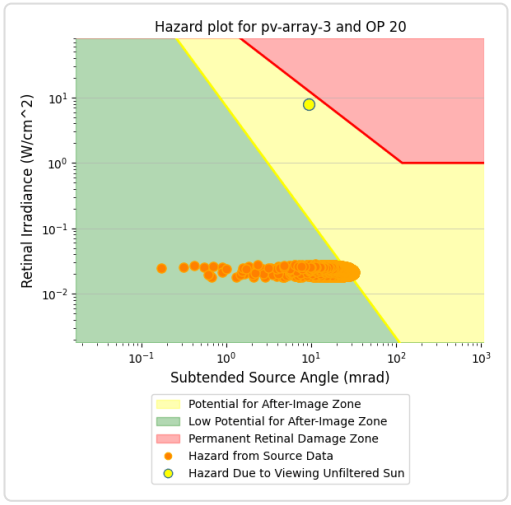
PV array 3 and OP 20

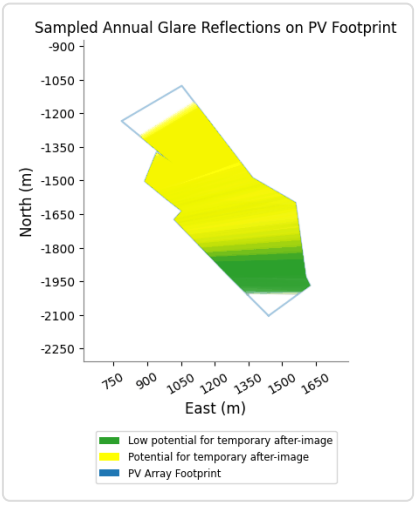
Yellow glare: 1,944 min.

Green glare: 1,192 min.





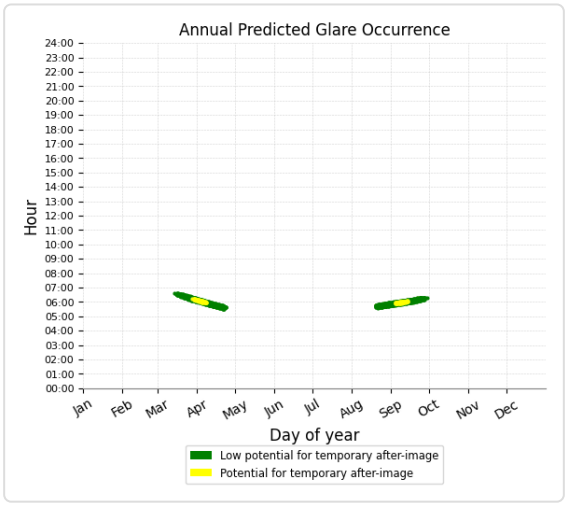


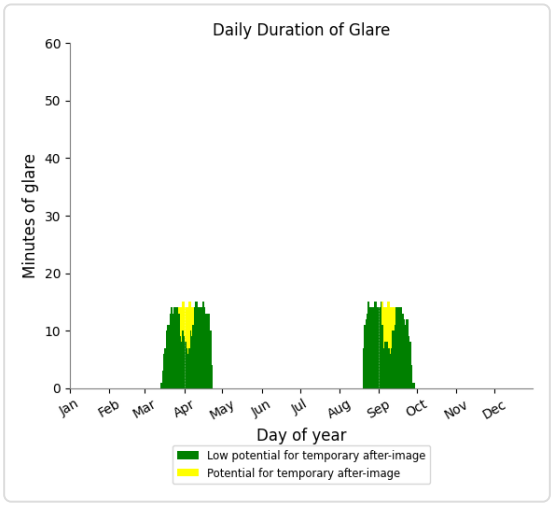


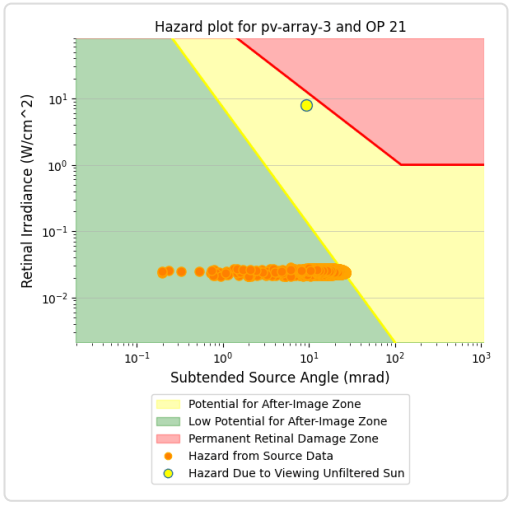
PV array 3 and OP 21

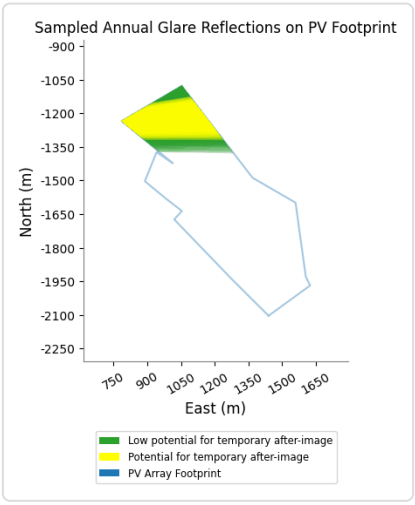
Yellow glare: 129 min.

Green glare: 894 min.





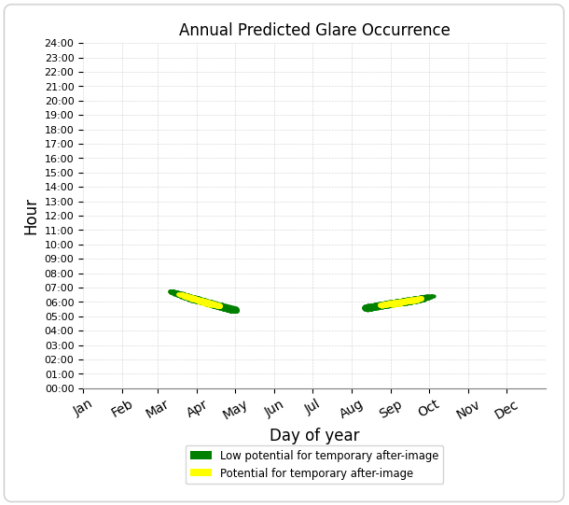


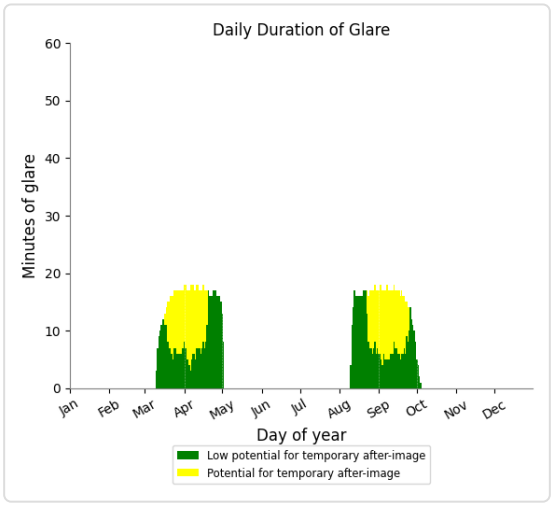


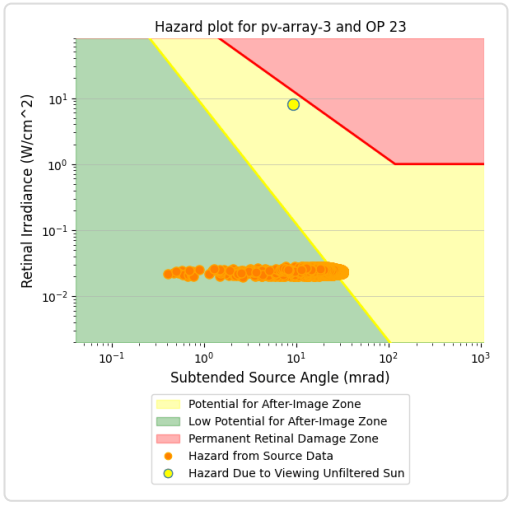
PV array 3 and OP 23

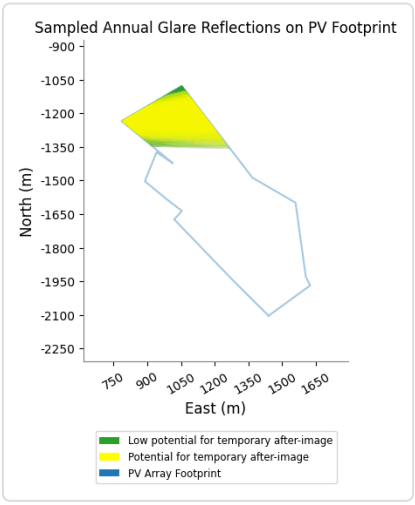
Yellow glare: 689 min.

Green glare: 977 min.





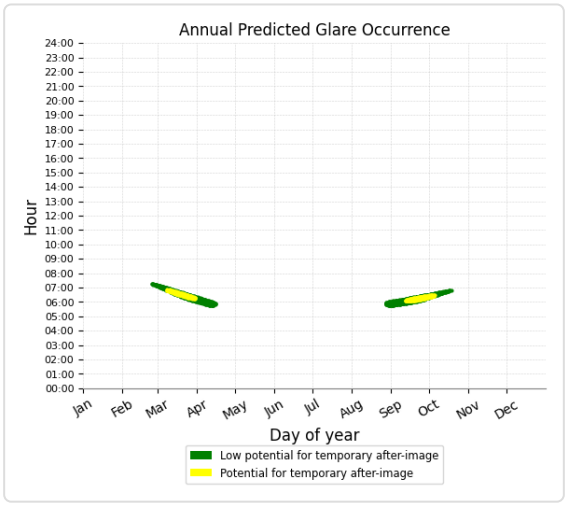


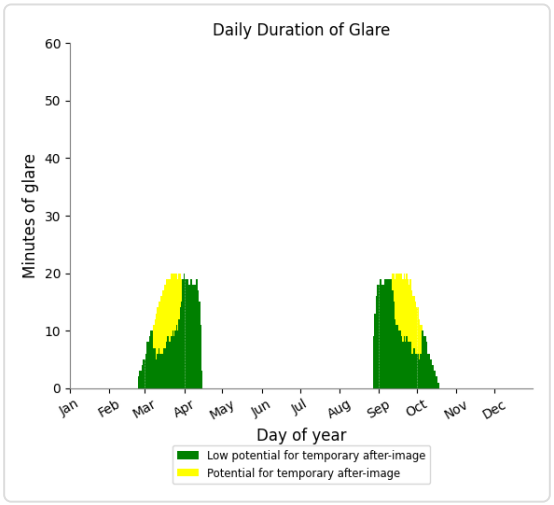


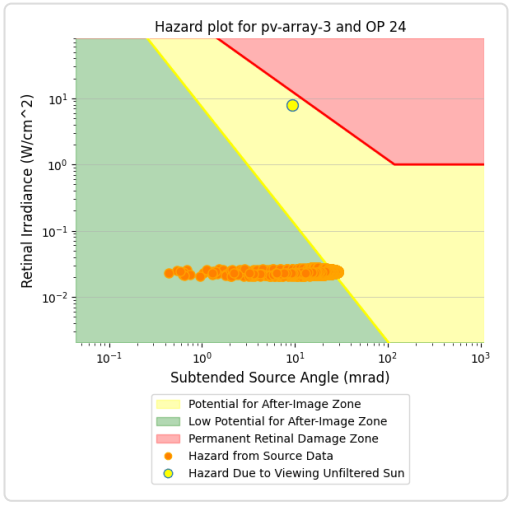
PV array 3 and OP 24

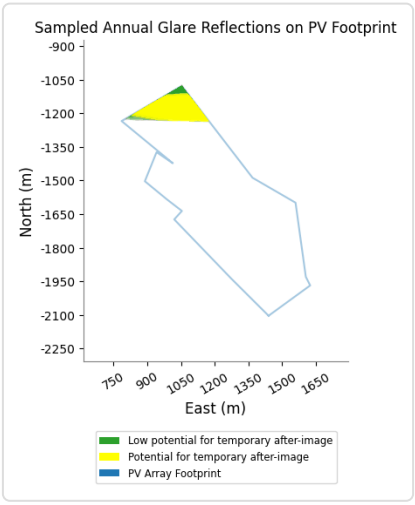
Yellow glare: 413 min.

Green glare: 1,083 min.



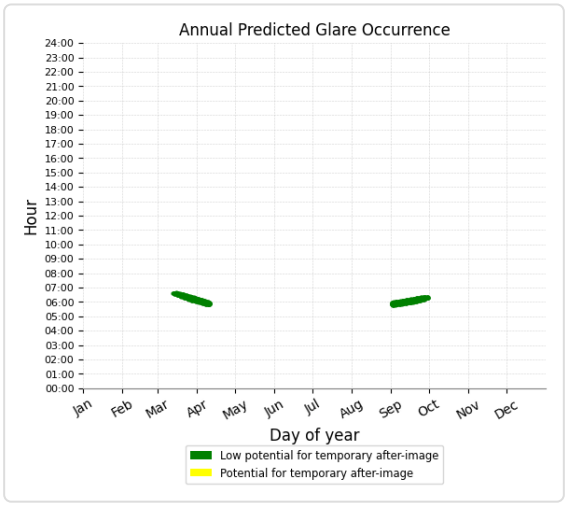


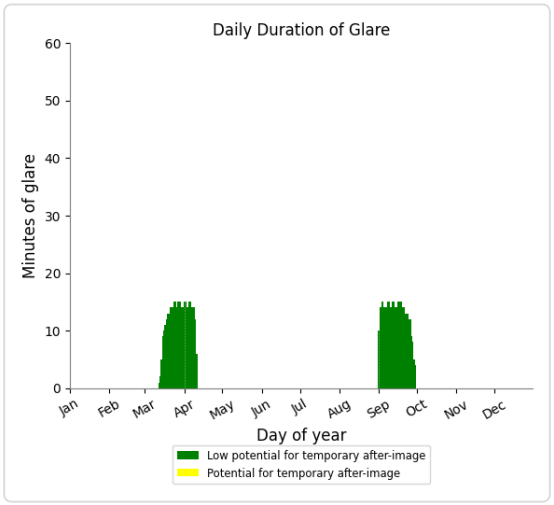


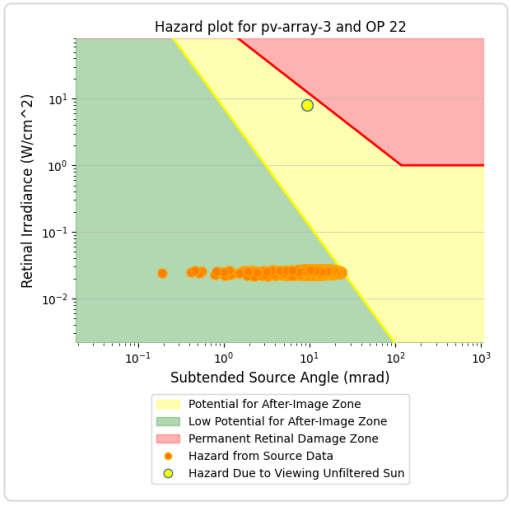


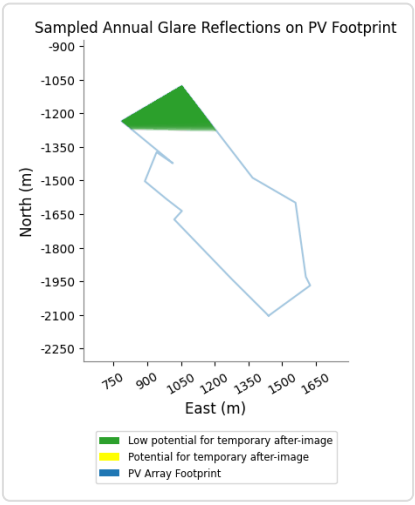
PV array 3 and OP 22

Yellow glare: none
Green glare: 771 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 7

No glare found

PV array 3 and OP 11

No glare found

PV array 3 and OP 13

No glare found

PV array 3 and OP 14

No glare found

PV array 3 and OP 15

No glare found

PV array 3 and OP 16

No glare found

PV array 3 and OP 17

No glare found

PV array 3 and OP 25

No glare found

PV array 3 and OP 26

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 29

No glare found

PV array 3 and OP 30

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **W2D**

Created 25 Jun, 2025
Updated 03 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 152942.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	10,863	181.1	894	14.9	-
PV array 2	25.0	180.0	104,173	1,736.2	75,877	1,264.6	-
PV array 3	25.0	180.0	10,789	179.8	17,726	295.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1D	118	2.0	2,477	41.3
PRoW 2D	92,542	1,542.4	49,422	823.7
PRoW 3D	965	16.1	7,602	126.7
PRoW 4D	0	0.0	0	0.0
Route 1D	60	1.0	772	12.9
Route 2D	0	0.0	0	0.0
Route 3D	2,236	37.3	667	11.1
Route 4D	1,621	27.0	735	12.2
Route 5D	1,481	24.7	3,577	59.6
Route 6D	0	0.0	0	0.0
OP 1	2,192	36.5	801	13.3
OP 2	1,715	28.6	493	8.2
OP 3	792	13.2	0	0.0
OP 4	1,218	20.3	38	0.6

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 5	1,777	29.6	560	9.3
OP 6	1,926	32.1	764	12.7
OP 7	2,164	36.1	1,303	21.7
OP 8	1,507	25.1	1,033	17.2
OP 9	984	16.4	990	16.5
OP 10	469	7.8	1,573	26.2
OP 11	0	0.0	0	0.0
OP 12	138	2.3	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	1,156	19.3	154	2.6
OP 19	1,051	17.5	3,395	56.6
OP 20	634	10.6	1,749	29.1
OP 21	594	9.9	310	5.2
OP 22	1,213	20.2	12	0.2
OP 23	687	11.4	771	12.8
OP 24	1,084	18.1	115	1.9
OP 25	767	12.8	2,757	46.0
OP 26	2,011	33.5	5,133	85.5
OP 27	267	4.5	1,870	31.2
OP 28	232	3.9	1,882	31.4
OP 29	1,092	18.2	2,163	36.0
OP 30	1,132	18.9	1,379	23.0

Component Data

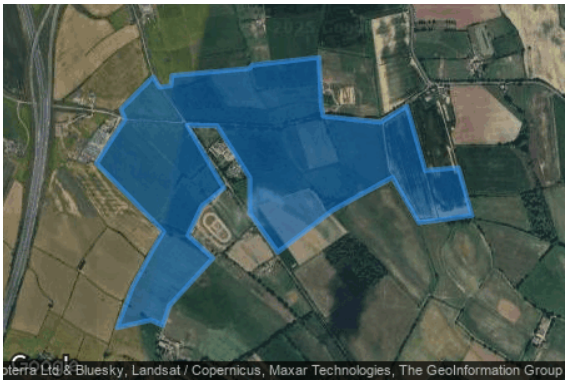
PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



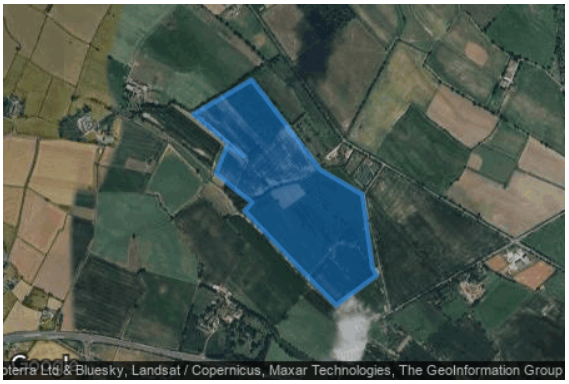
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.383281	-1.277395	113.80	3.80	117.60
2	53.383230	-1.276751	112.90	3.80	116.70
3	53.383819	-1.275463	113.00	3.80	116.80
4	53.384459	-1.275292	114.10	3.80	117.90
5	53.384523	-1.275549	113.90	3.80	117.70
6	53.385124	-1.275163	117.90	3.80	121.70
7	53.386046	-1.273103	115.10	3.80	118.90
8	53.386570	-1.273811	113.50	3.80	117.30
9	53.386481	-1.274691	113.60	3.80	117.40
10	53.387159	-1.276343	111.00	3.80	114.80
11	53.386071	-1.277030	114.90	3.80	118.70
12	53.385227	-1.277287	117.20	3.80	121.00

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382901	-1.272780	111.42	3.80	115.22
2	53.384091	-1.270806	114.08	3.80	117.88
3	53.384207	-1.270549	114.96	3.80	118.76
4	53.383797	-1.270141	112.70	3.80	116.50
5	53.383861	-1.269347	112.03	3.80	115.83
6	53.384271	-1.269283	114.04	3.80	117.84
7	53.384565	-1.263940	109.02	3.80	112.82
8	53.384693	-1.263790	109.50	3.80	113.30
9	53.385013	-1.259176	106.02	3.80	109.82
10	53.383080	-1.259026	102.82	3.80	106.62
11	53.382607	-1.258876	105.60	3.80	109.40
12	53.382365	-1.254968	100.44	3.80	104.24
13	53.383018	-1.253144	106.00	3.80	109.80
14	53.380394	-1.251878	101.04	3.80	104.84
15	53.380509	-1.249603	102.09	3.80	105.89
16	53.378551	-1.248659	100.79	3.80	104.59
17	53.378256	-1.252307	98.79	3.80	102.59
18	53.380112	-1.254131	100.47	3.80	104.27
19	53.378768	-1.258229	105.86	3.80	109.66
20	53.377053	-1.262008	102.04	3.80	105.84
21	53.378665	-1.263939	105.01	3.80	108.81
22	53.380112	-1.263939	110.51	3.80	114.31
23	53.382224	-1.266192	109.63	3.80	113.43
24	53.382236	-1.268223	110.90	3.80	114.70
25	53.379677	-1.265713	106.89	3.80	110.69
26	53.378915	-1.267247	105.15	0.00	105.15
27	53.377744	-1.268180	103.85	3.80	107.65
28	53.376809	-1.266464	99.36	3.80	103.16
29	53.374864	-1.269468	111.80	3.80	115.60
30	53.374435	-1.269693	112.98	3.80	116.78
31	53.374057	-1.269918	112.03	3.80	115.83
32	53.374281	-1.270734	113.69	3.80	117.49
33	53.373967	-1.273051	117.72	3.80	121.52
34	53.375670	-1.271968	116.93	3.80	120.73
35	53.377373	-1.270390	104.13	3.80	107.93
36	53.377897	-1.269854	103.35	3.80	107.15
37	53.380688	-1.274489	108.43	3.80	112.23
38	53.382473	-1.272515	111.56	3.80	115.36

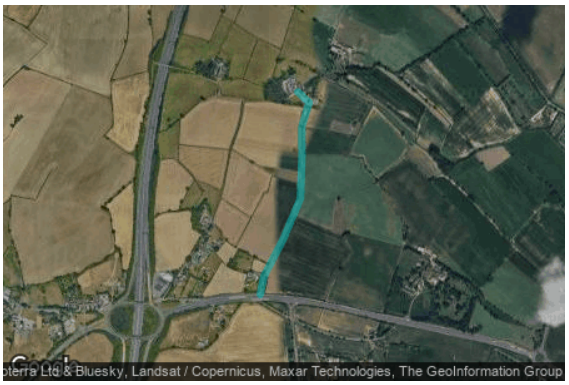
Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.364385	-1.255756	96.26	3.80	100.06
2	53.365599	-1.252975	98.15	3.80	101.95
3	53.365947	-1.253267	96.51	3.80	100.31
4	53.368917	-1.253954	97.15	3.80	100.95
5	53.369916	-1.256829	96.24	3.80	100.04
6	53.373603	-1.261561	98.84	3.80	102.64
7	53.372188	-1.265584	105.90	3.80	109.70
8	53.370498	-1.262161	99.17	3.80	102.97
9	53.370940	-1.263245	101.66	3.80	105.46
10	53.369775	-1.264028	99.03	3.80	102.83
11	53.369045	-1.262548	97.83	3.80	101.63
12	53.368584	-1.261550	98.81	3.80	102.61
13	53.368245	-1.262065	98.03	3.80	101.83
14	53.365870	-1.258245	99.59	3.80	103.39
15	53.365588	-1.257773	99.82	3.80	103.62

Route Receptors

Name: PRoW 1D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.363281	-1.275051	117.67	2.75	120.42
2	53.364002	-1.274820	118.86	2.75	121.61
3	53.365618	-1.273415	115.44	2.75	118.19
4	53.367206	-1.272299	110.55	2.75	113.30
5	53.368947	-1.272192	114.22	2.75	116.97
6	53.370163	-1.272192	111.27	2.75	114.02
7	53.371123	-1.271698	110.52	2.75	113.27
8	53.371559	-1.272471	110.44	2.75	113.19

Name: PRoW 2D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381921	-1.267911	111.51	2.75	114.26
2	53.380898	-1.269820	109.56	2.75	112.31
3	53.379733	-1.271505	110.14	2.75	112.89
4	53.378363	-1.273264	107.69	2.75	110.44
5	53.376981	-1.275045	114.70	2.75	117.45
6	53.375304	-1.276140	116.00	2.75	118.75
7	53.373717	-1.277448	114.32	2.75	117.07
8	53.372104	-1.278350	109.72	2.75	112.47
9	53.372001	-1.277899	108.96	2.75	111.71
10	53.371399	-1.278157	110.49	2.75	113.24
11	53.369953	-1.281504	112.57	2.75	115.32
12	53.368544	-1.280581	116.49	2.75	119.24
13	53.367955	-1.279444	115.14	2.75	117.89
14	53.366470	-1.278414	119.13	2.75	121.88

Name: PRoW 3D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.372392	-1.268071	109.27	2.75	112.02
2	53.374005	-1.266730	107.26	2.75	110.01
3	53.374529	-1.264627	100.70	2.75	103.45
4	53.375521	-1.262643	98.61	2.75	101.36
5	53.376533	-1.260186	98.22	2.75	100.97
6	53.377800	-1.256935	102.76	2.75	105.51
7	53.379362	-1.256227	102.64	2.75	105.39
8	53.381090	-1.255497	100.07	2.75	102.82
9	53.382459	-1.254746	101.26	2.75	104.01

Name: PRoW 4D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.363409	-1.253990	95.74	2.75	98.49
2	53.362705	-1.256833	100.85	2.75	103.60
3	53.361988	-1.259515	110.61	2.75	113.36
4	53.361663	-1.260484	111.21	2.75	113.96
5	53.361343	-1.260543	112.09	2.75	114.84
6	53.359602	-1.260157	118.34	2.75	121.09
7	53.358683	-1.260216	118.61	2.75	121.36
8	53.357722	-1.258843	117.43	2.75	120.18
9	53.357495	-1.258534	118.60	2.75	121.35
10	53.357418	-1.257855	117.06	2.75	119.81

Name: Route 1D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.390918	-1.281780	96.11	1.50	97.61
2	53.389268	-1.280621	103.30	1.50	104.80
3	53.387591	-1.279784	108.30	1.50	109.80
4	53.385838	-1.278819	111.22	1.50	112.72
5	53.384008	-1.278218	110.96	1.50	112.46
6	53.382254	-1.278132	114.27	1.50	115.77
7	53.380488	-1.278452	114.23	1.50	115.73
8	53.378735	-1.278881	112.27	1.50	113.77
9	53.376994	-1.279504	111.35	1.50	112.85
10	53.375214	-1.280276	110.54	1.50	112.04
11	53.373461	-1.281220	109.22	1.50	110.72
12	53.371720	-1.281907	109.06	1.50	110.56
13	53.369927	-1.282508	108.71	1.50	110.21
14	53.368084	-1.282894	106.49	1.50	107.99
15	53.366266	-1.283216	103.18	1.50	104.68

Name: Route 2D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.392531	-1.273227	113.52	1.50	115.02
2	53.390765	-1.274471	115.58	1.50	117.08
3	53.389383	-1.275759	114.68	1.50	116.18
4	53.387681	-1.276769	117.35	1.50	118.85
5	53.385940	-1.277478	118.56	1.50	120.06
6	53.384142	-1.277617	114.25	1.50	115.75
7	53.383067	-1.277703	113.42	1.50	114.92

Name: Route 3D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.387005	-1.252769	107.15	1.50	108.65
2	53.385188	-1.252747	108.53	1.50	110.03
3	53.383870	-1.251546	108.99	1.50	110.49
4	53.383895	-1.248585	105.32	1.50	106.82
5	53.383929	-1.245512	103.38	1.50	104.88
6	53.383987	-1.244074	104.22	1.50	105.72
7	53.383020	-1.241617	104.63	1.50	106.13
8	53.382037	-1.239276	109.66	1.50	111.16
9	53.380974	-1.236829	107.94	1.50	109.44
10	53.379906	-1.234415	105.13	1.50	106.63

Name: Route 4D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.363141	-1.274852	116.78	1.50	118.28
2	53.363000	-1.272020	119.58	1.50	121.08
3	53.362616	-1.269037	120.39	1.50	121.89
4	53.362232	-1.266119	118.92	1.50	120.42
5	53.361890	-1.263510	115.98	1.50	117.48
6	53.361480	-1.260591	110.85	1.50	112.35
7	53.361096	-1.257909	106.11	1.50	107.61
8	53.360546	-1.255442	101.85	1.50	103.35
9	53.359393	-1.253124	100.25	1.50	101.75
10	53.358599	-1.250378	96.86	1.50	98.36
11	53.357703	-1.247867	95.43	1.50	96.93
12	53.356781	-1.246279	96.44	1.50	97.94

Name: Route 5D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361032	-1.255720	103.17	1.50	104.67
2	53.362684	-1.254733	98.24	1.50	99.74
3	53.363401	-1.253907	95.69	1.50	97.19
4	53.364278	-1.251386	97.11	1.50	98.61
5	53.365136	-1.248757	94.85	1.50	96.35
6	53.366026	-1.246097	98.48	1.50	99.98
7	53.366948	-1.243500	99.80	1.50	101.30
8	53.367825	-1.240925	96.76	1.50	98.26
9	53.368664	-1.238404	98.91	1.50	100.41

Name: Route 6D
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.381006	-1.234249	105.64	1.50	107.14
2	53.379215	-1.234549	105.00	1.50	106.50
3	53.377499	-1.235022	101.62	1.50	103.12
4	53.375758	-1.235494	99.46	1.50	100.96
5	53.373966	-1.235665	100.70	1.50	102.20
6	53.372200	-1.235537	102.10	1.50	103.60

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.383355	-1.251683	109.34	2.00
OP 2	2	53.383595	-1.250439	109.35	2.00
OP 3	3	53.384663	-1.248289	105.86	2.00
OP 4	4	53.383678	-1.246366	103.52	2.00
OP 5	5	53.381683	-1.240134	108.46	2.00
OP 6	6	53.379593	-1.234054	105.00	2.00
OP 7	7	53.376249	-1.235028	100.31	2.00
OP 8	8	53.370611	-1.255135	96.29	2.00
OP 9	9	53.364903	-1.238123	96.27	2.00
OP 10	10	53.365570	-1.246672	97.24	2.00
OP 11	11	53.364672	-1.249349	95.97	2.00
OP 12	12	53.363536	-1.252706	96.11	2.00
OP 13	13	53.360383	-1.246192	93.42	2.00
OP 14	14	53.359097	-1.252812	99.32	2.00
OP 15	15	53.361543	-1.255970	104.65	2.00
OP 16	16	53.358951	-1.256570	108.59	2.00
OP 17	17	53.356749	-1.257538	119.68	2.00
OP 18	18	53.362991	-1.261851	114.83	2.00
OP 19	19	53.364867	-1.263063	120.67	2.00
OP 20	20	53.366291	-1.278697	118.27	2.00
OP 21	21	53.371527	-1.277892	110.75	2.00
OP 22	22	53.372500	-1.277796	112.02	2.00
OP 23	23	53.371796	-1.272394	111.12	2.00
OP 24	24	53.372958	-1.269545	112.15	2.00
OP 25	25	53.376424	-1.262688	100.79	2.00
OP 26	26	53.380306	-1.265001	110.66	2.00
OP 27	27	53.381070	-1.279607	109.35	2.00
OP 28	28	53.382068	-1.276726	111.16	2.00
OP 29	29	53.382335	-1.273413	111.90	2.00
OP 30	30	53.383395	-1.274753	112.25	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	10,863	181.1	894	14.9	-
PV array 2	25.0	180.0	104,173	1,736.2	75,877	1,264.6	-
PV array 3	25.0	180.0	10,789	179.8	17,726	295.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1D	118	2.0	2,477	41.3
PRoW 2D	92,542	1,542.4	49,422	823.7
PRoW 3D	965	16.1	7,602	126.7
PRoW 4D	0	0.0	0	0.0
Route 1D	60	1.0	772	12.9
Route 2D	0	0.0	0	0.0
Route 3D	2,236	37.3	667	11.1
Route 4D	1,621	27.0	735	12.2
Route 5D	1,481	24.7	3,577	59.6
Route 6D	0	0.0	0	0.0
OP 1	2,192	36.5	801	13.3
OP 2	1,715	28.6	493	8.2
OP 3	792	13.2	0	0.0
OP 4	1,218	20.3	38	0.6
OP 5	1,777	29.6	560	9.3
OP 6	1,926	32.1	764	12.7
OP 7	2,164	36.1	1,303	21.7
OP 8	1,507	25.1	1,033	17.2
OP 9	984	16.4	990	16.5
OP 10	469	7.8	1,573	26.2
OP 11	0	0.0	0	0.0
OP 12	138	2.3	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	1,156	19.3	154	2.6
OP 19	1,051	17.5	3,395	56.6
OP 20	634	10.6	1,749	29.1

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 21	594	9.9	310	5.2
OP 22	1,213	20.2	12	0.2
OP 23	687	11.4	771	12.8
OP 24	1,084	18.1	115	1.9
OP 25	767	12.8	2,757	46.0
OP 26	2,011	33.5	5,133	85.5
OP 27	267	4.5	1,870	31.2
OP 28	232	3.9	1,882	31.4
OP 29	1,092	18.2	2,163	36.0
OP 30	1,132	18.9	1,379	23.0

PV: PV array 1 potential temporary after-image

Receptor results ordered by category of glare

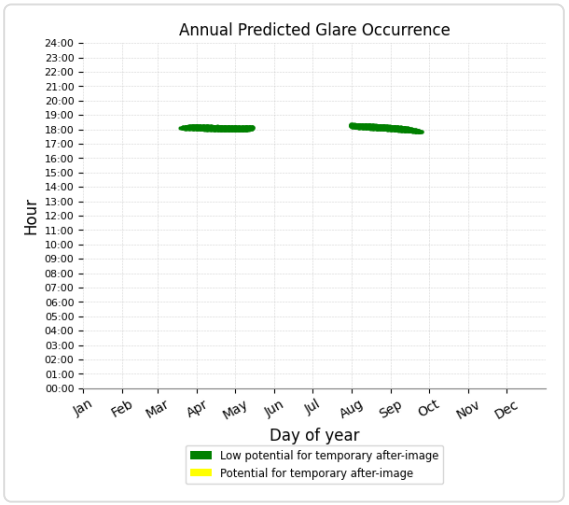
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 3D	1,374	22.9	0	0.0
PRoW 1D	0	0.0	0	0.0
PRoW 2D	0	0.0	0	0.0
PRoW 3D	0	0.0	0	0.0
PRoW 4D	0	0.0	0	0.0
Route 1D	0	0.0	0	0.0
Route 2D	0	0.0	0	0.0
Route 4D	0	0.0	0	0.0
Route 5D	0	0.0	0	0.0
Route 6D	0	0.0	0	0.0
OP 30	531	8.8	894	14.9
OP 1	1,180	19.7	0	0.0
OP 2	1,045	17.4	0	0.0
OP 3	652	10.9	0	0.0
OP 4	822	13.7	0	0.0
OP 5	1,053	17.6	0	0.0
OP 6	1,036	17.3	0	0.0
OP 7	1,522	25.4	0	0.0
OP 26	879	14.7	0	0.0
OP 29	769	12.8	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0

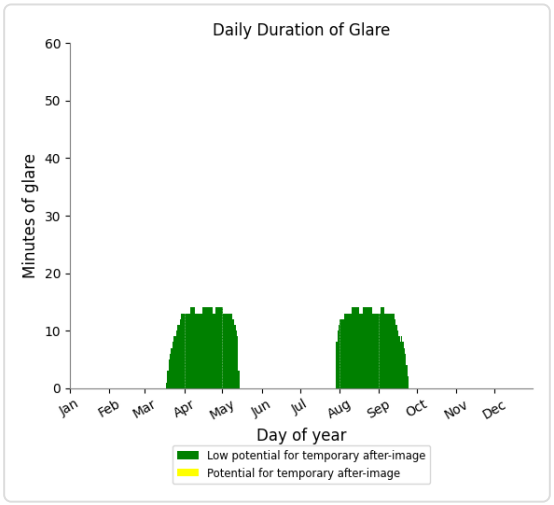
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 25	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0

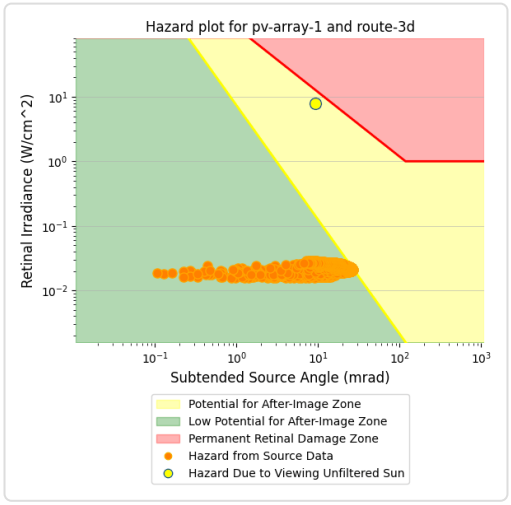
PV array 1 and Route: Route 3D

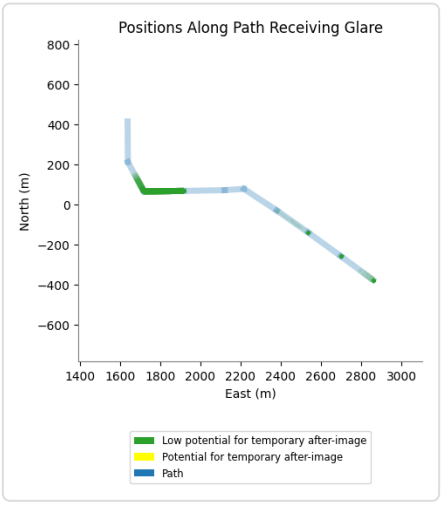
Yellow glare: none

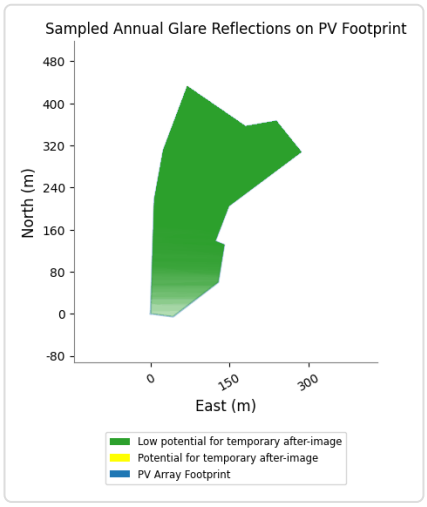
Green glare: 1,374 min.











PV array 1 and Route: PRoW 1D

No glare found

PV array 1 and Route: PRoW 2D

No glare found

PV array 1 and Route: PRoW 3D

No glare found

PV array 1 and Route: PRoW 4D

No glare found

PV array 1 and Route: Route 1D

No glare found

PV array 1 and Route: Route 2D

No glare found

PV array 1 and Route: Route 4D

No glare found

PV array 1 and Route: Route 5D

No glare found

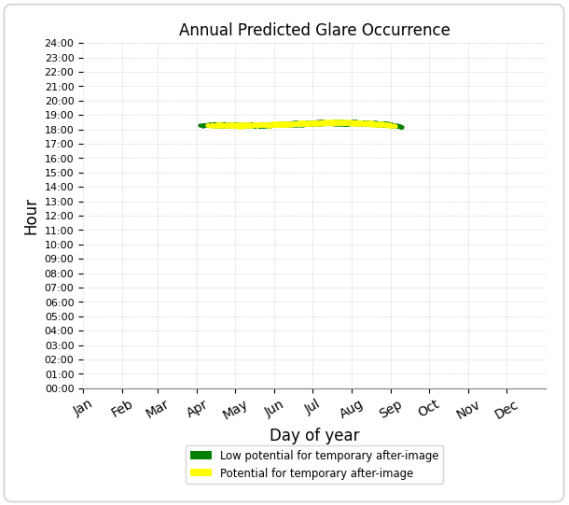
PV array 1 and Route: Route 6D

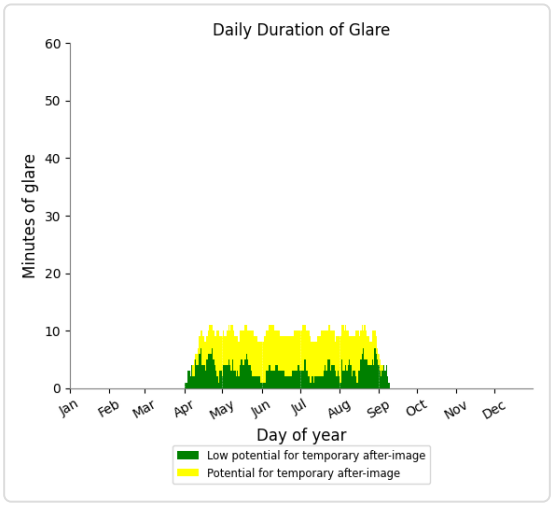
No glare found

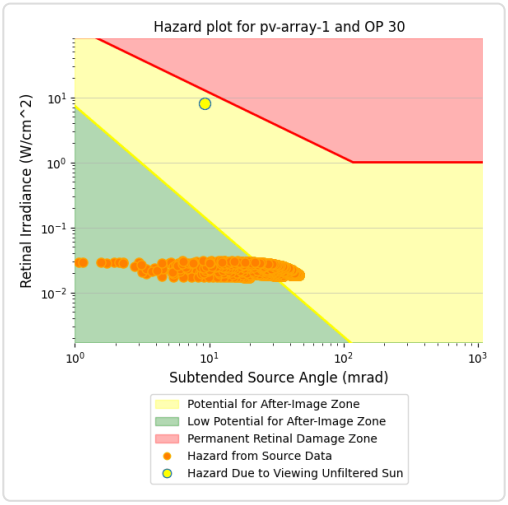
PV array 1 and OP 30

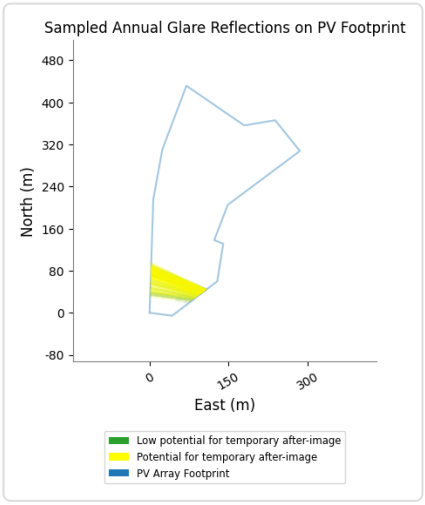
Yellow glare: 894 min.

Green glare: 531 min.





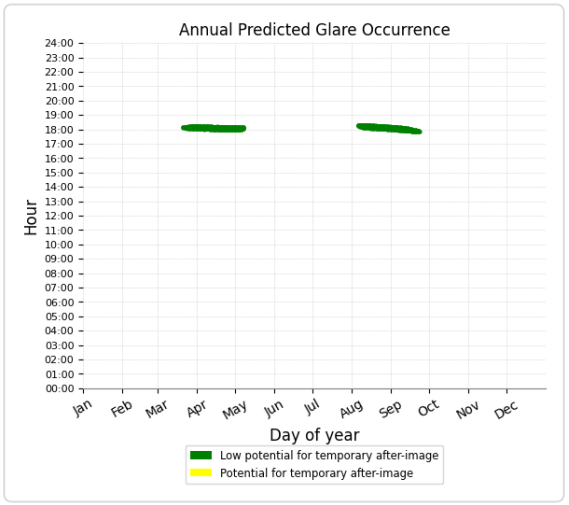


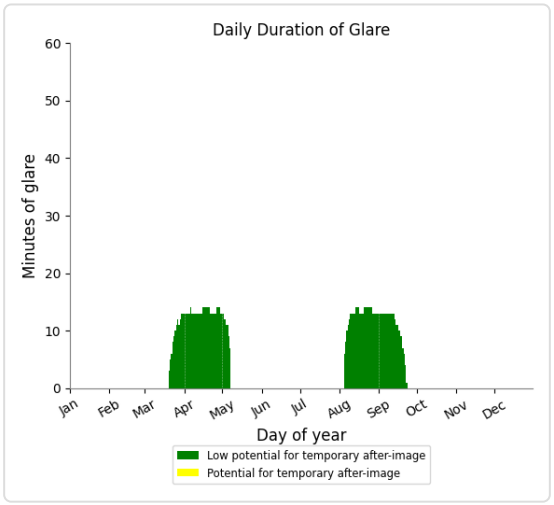


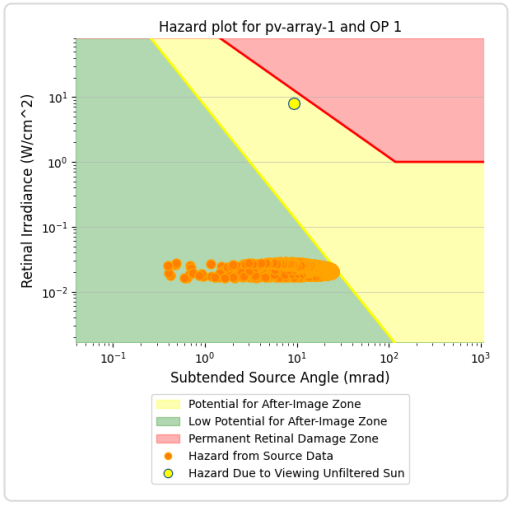
PV array 1 and OP 1

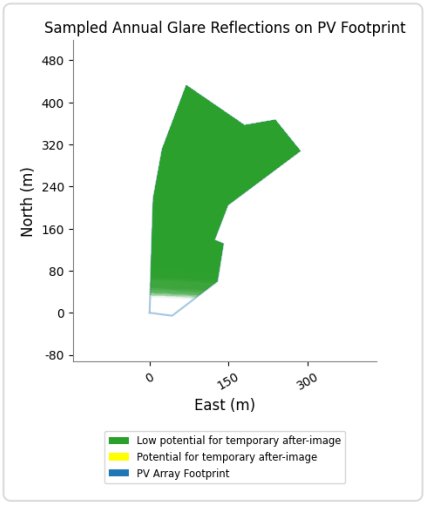
Yellow glare: none

Green glare: 1,180 min.





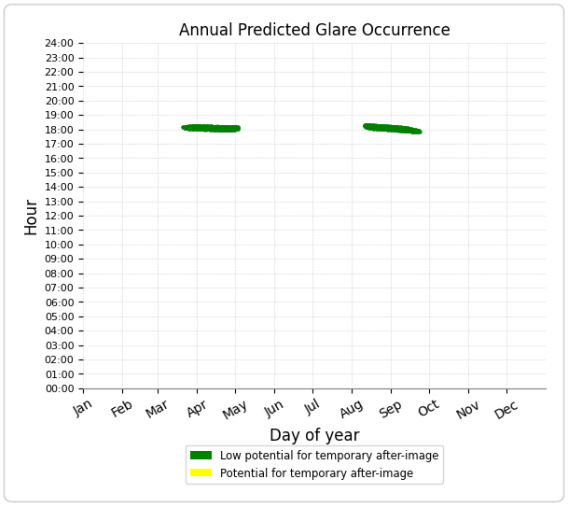


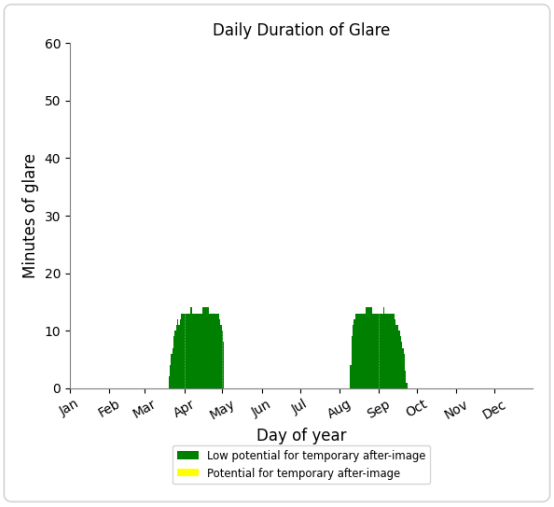


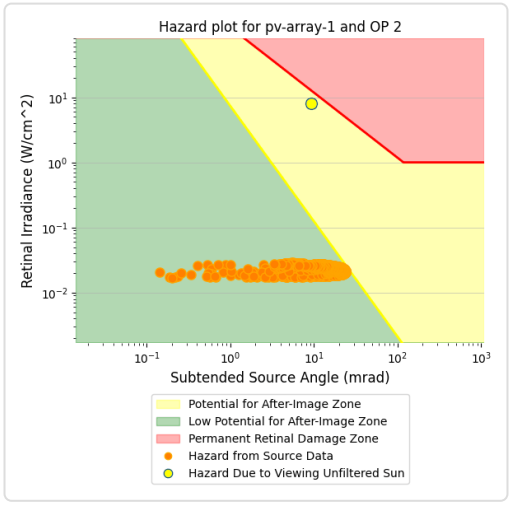
PV array 1 and OP 2

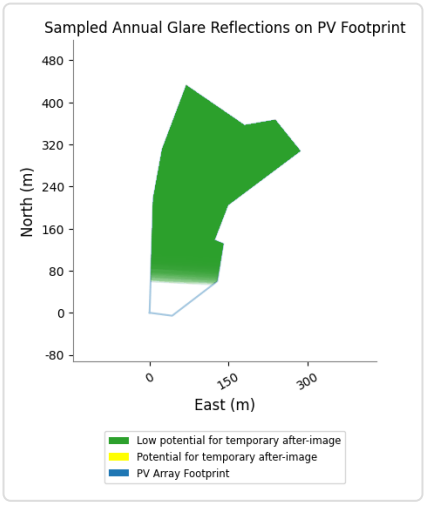
Yellow glare: none

Green glare: 1,045 min.





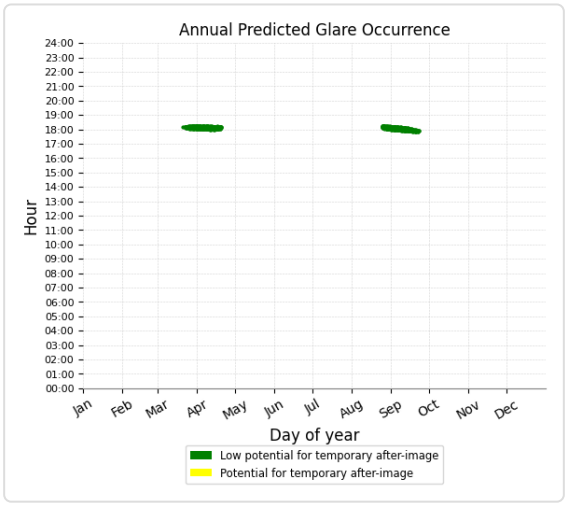


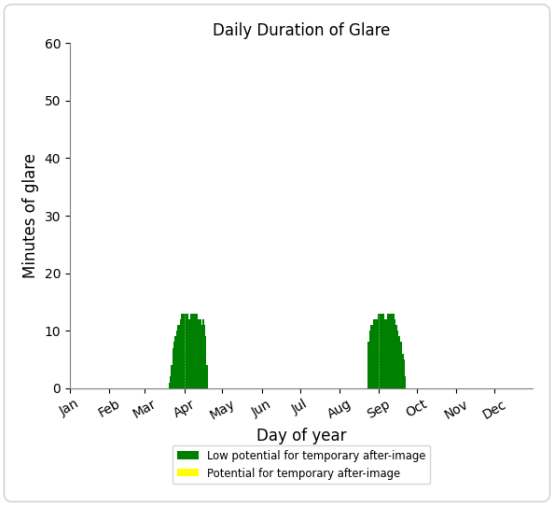


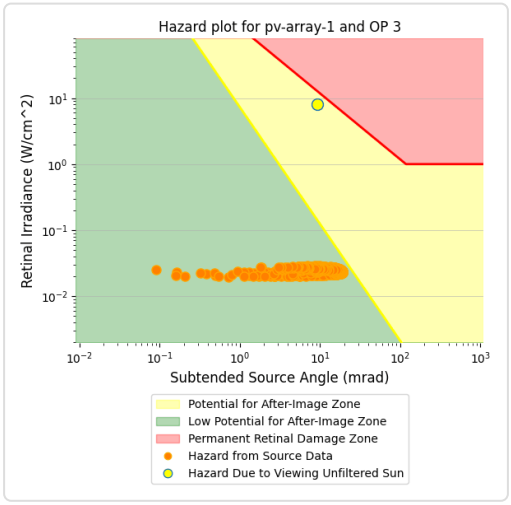
PV array 1 and OP 3

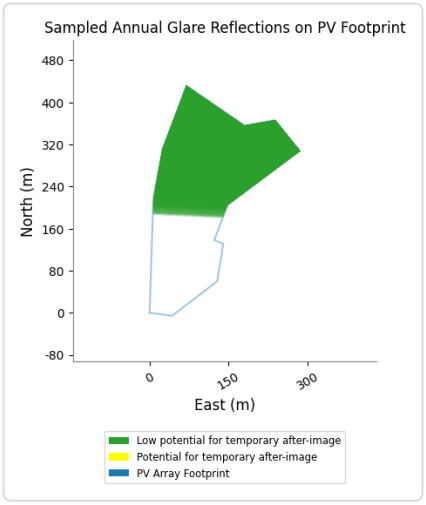
Yellow glare: none

Green glare: 652 min.





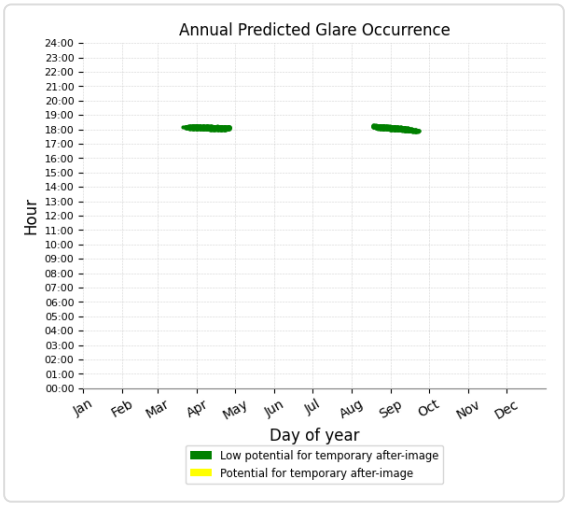


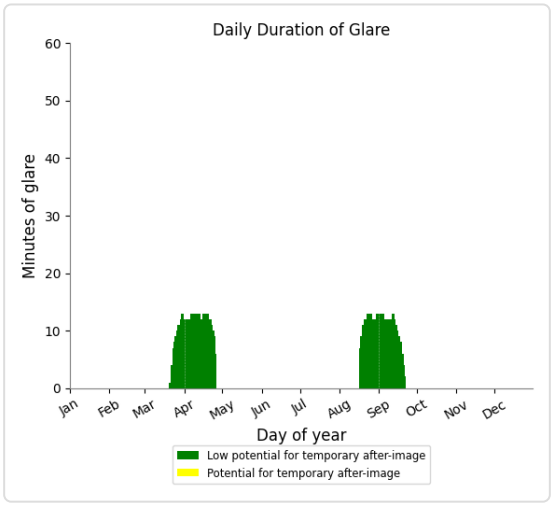


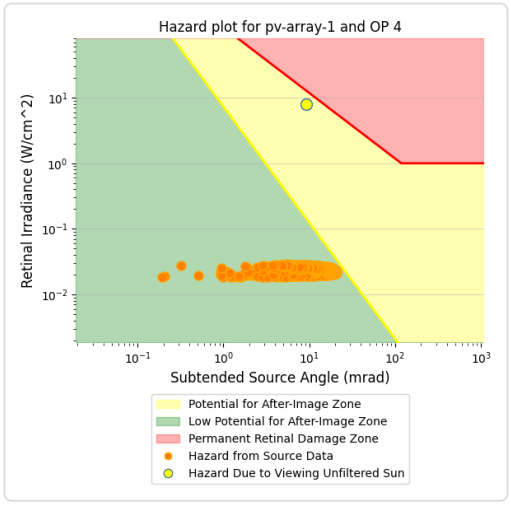
PV array 1 and OP 4

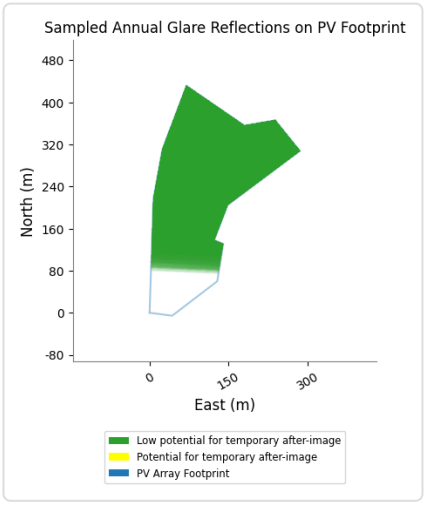
Yellow glare: none

Green glare: 822 min.





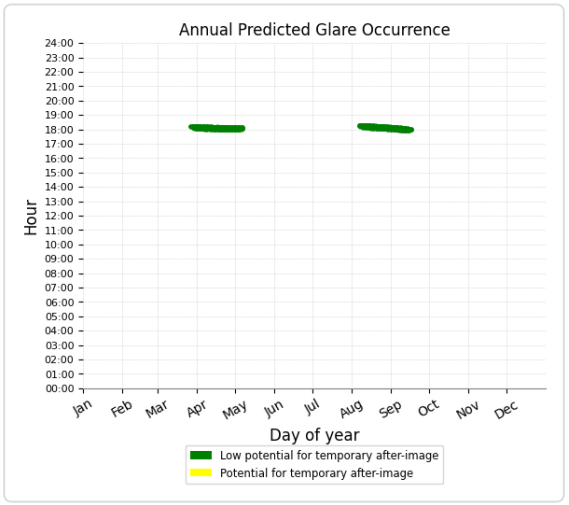


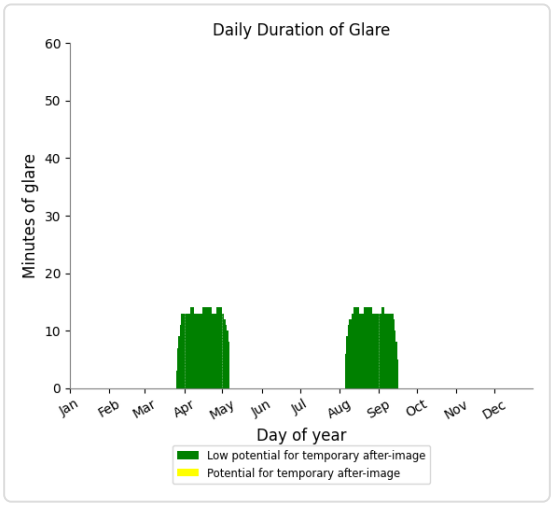


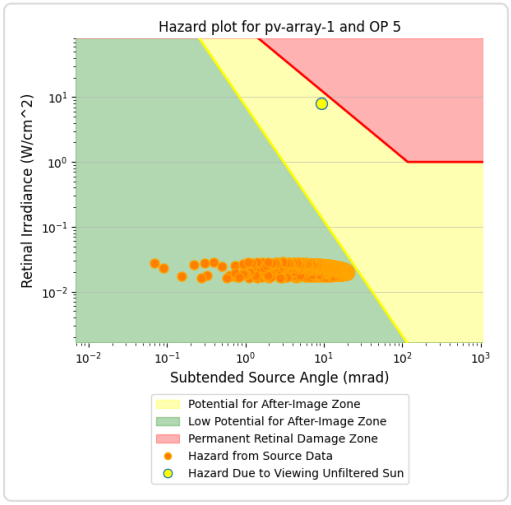
PV array 1 and OP 5

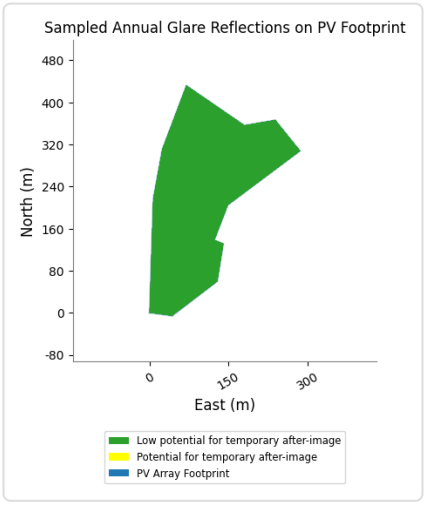
Yellow glare: none

Green glare: 1,053 min.





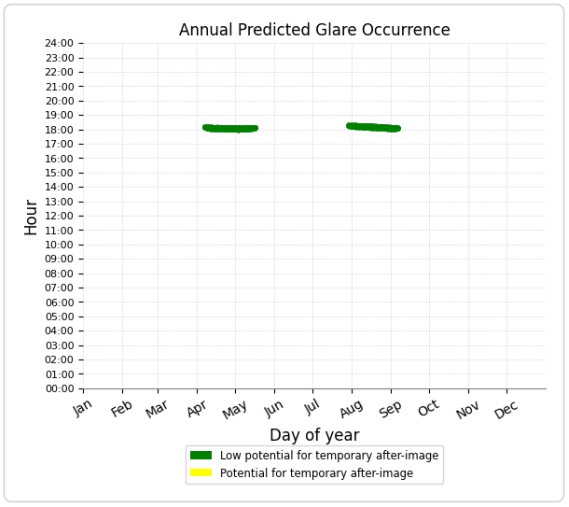


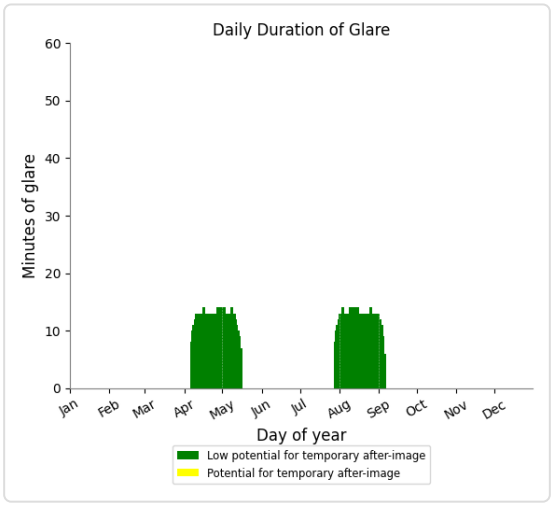


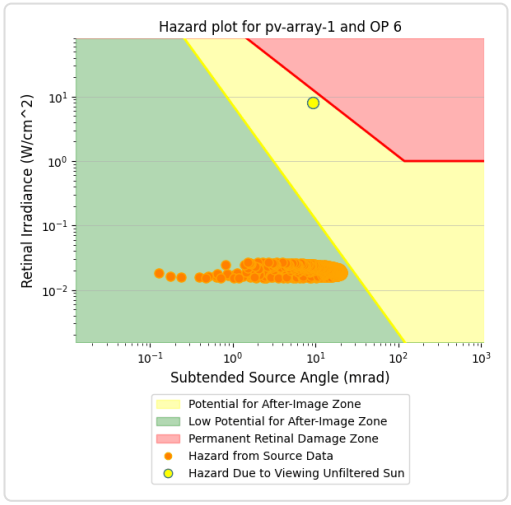
PV array 1 and OP 6

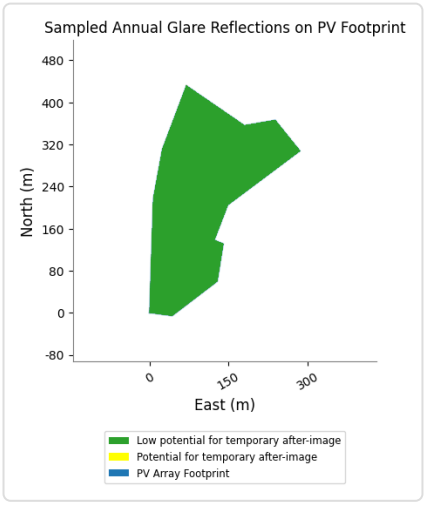
Yellow glare: none

Green glare: 1,036 min.





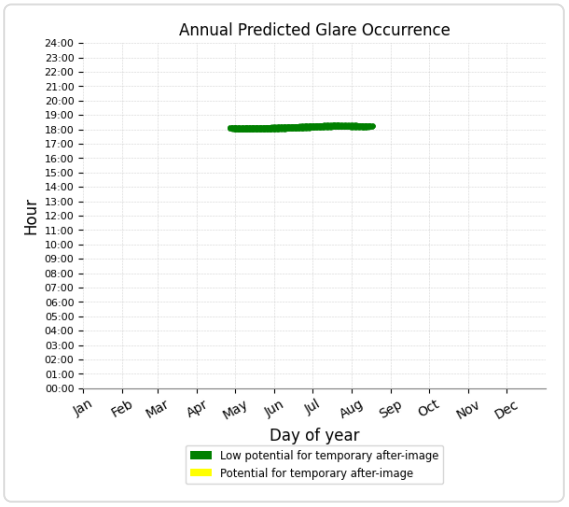


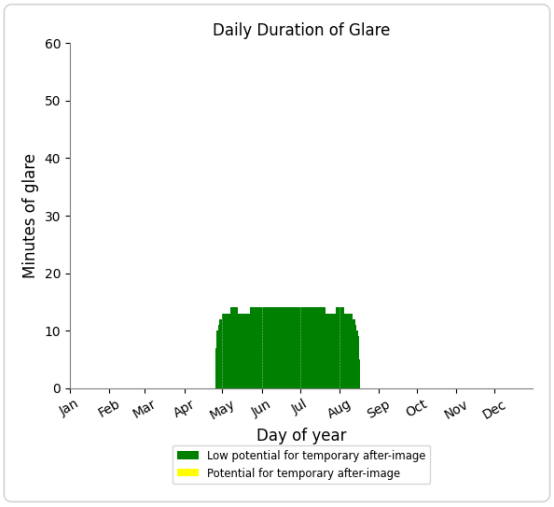


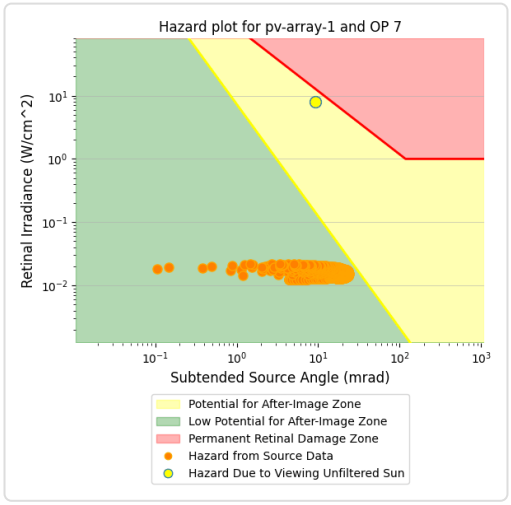
PV array 1 and OP 7

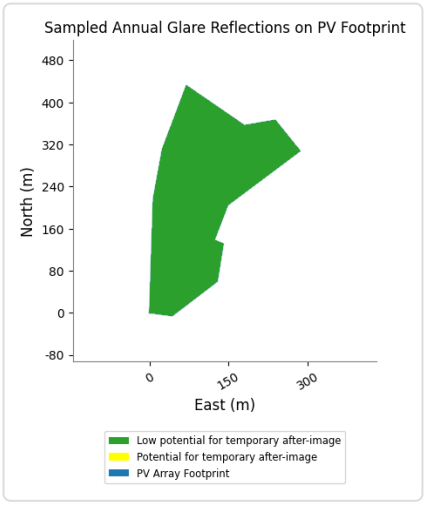
Yellow glare: none

Green glare: 1,522 min.





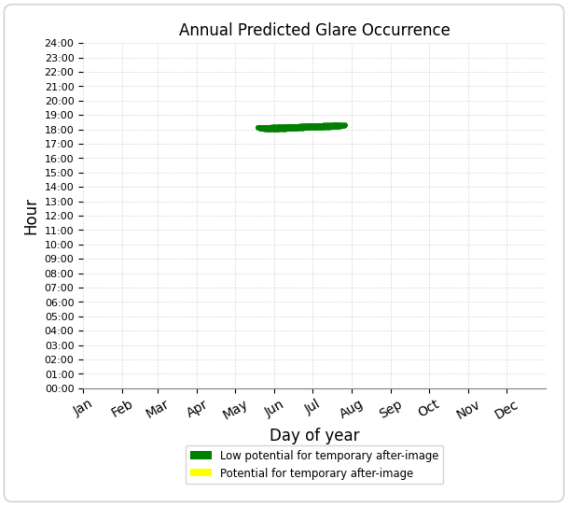


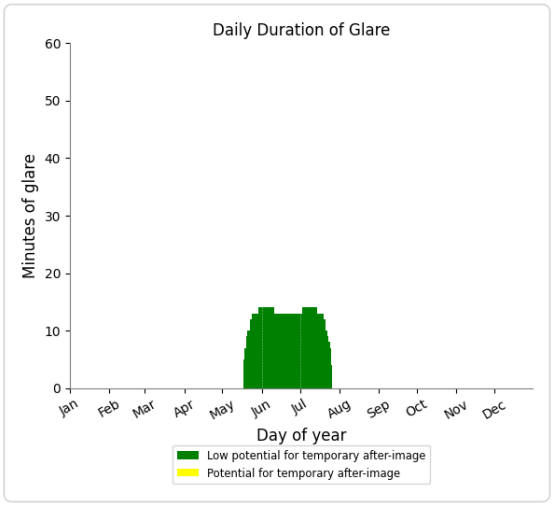


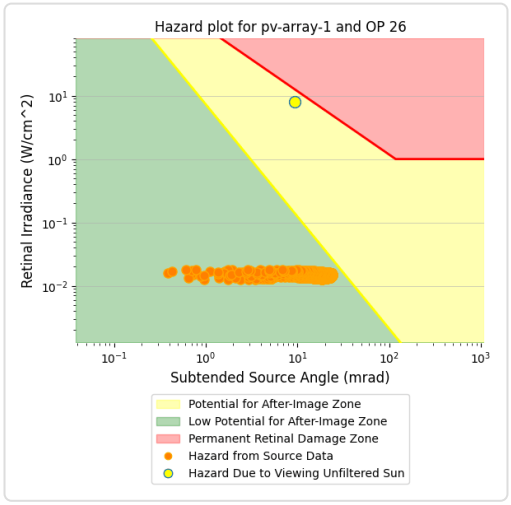
PV array 1 and OP 26

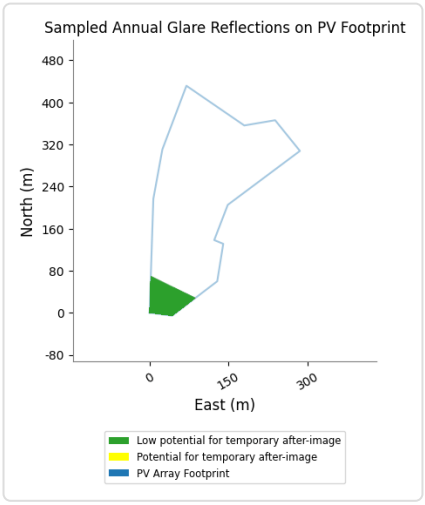
Yellow glare: none

Green glare: 879 min.



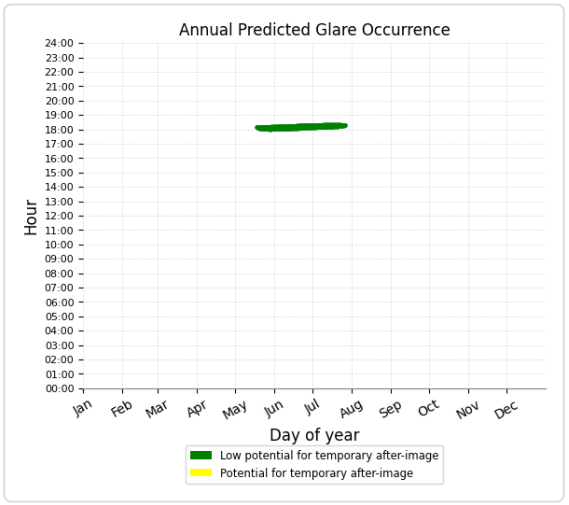


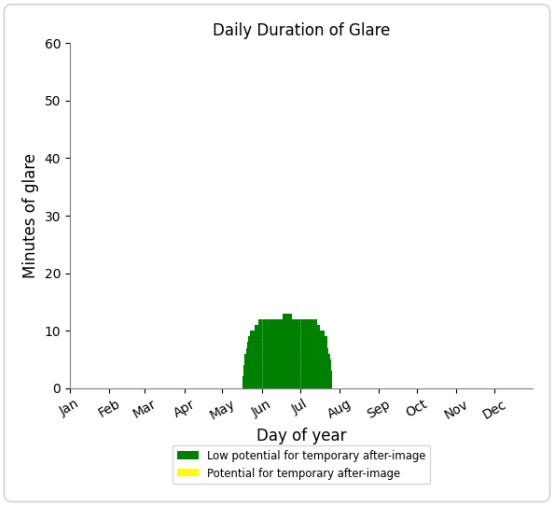


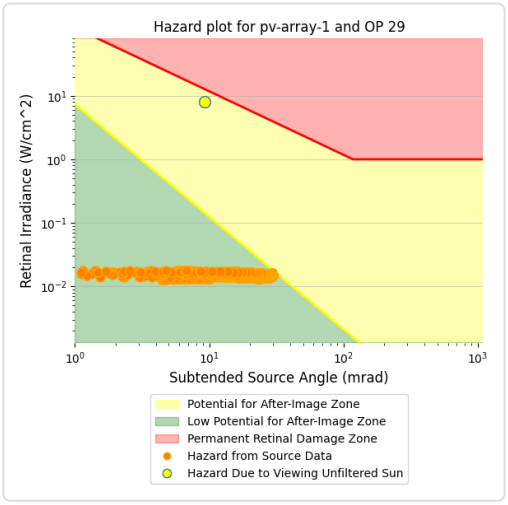


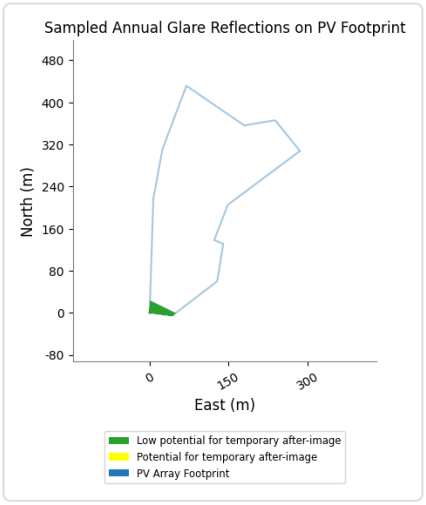
PV array 1 and OP 29

Yellow glare: none
Green glare: 769 min.









PV array 1 and OP 8

No glare found

PV array 1 and OP 9

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 11

No glare found

PV array 1 and OP 12

No glare found

PV array 1 and OP 13

No glare found

PV array 1 and OP 14

No glare found

PV array 1 and OP 15

No glare found

PV array 1 and OP 16

No glare found

PV array 1 and OP 17

No glare found

PV array 1 and OP 18

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 22

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV array 1 and OP 27

No glare found

PV array 1 and OP 28

No glare found

PV: PV array 2 potential temporary after-image

Receptor results ordered by category of glare

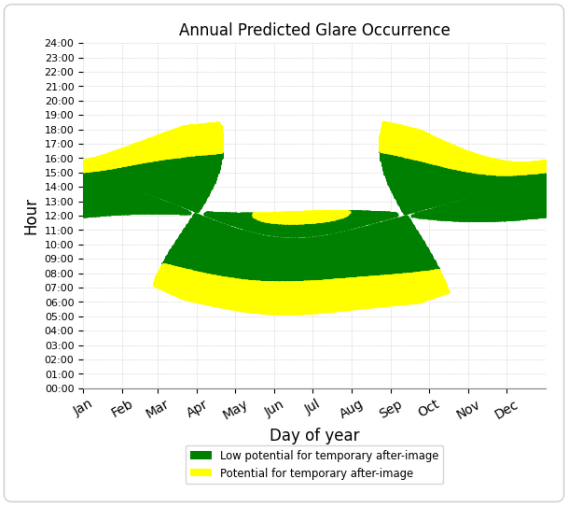
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 2D	92,063	1,534.4	48,575	809.6
PRoW 3D	483	8.1	7,223	120.4
Route 1D	60	1.0	772	12.9
Route 3D	862	14.4	667	11.1
Route 5D	805	13.4	225	3.8
PRoW 1D	0	0.0	0	0.0
PRoW 4D	0	0.0	0	0.0
Route 2D	0	0.0	0	0.0
Route 4D	0	0.0	0	0.0
Route 6D	0	0.0	0	0.0
OP 1	1,012	16.9	801	13.3
OP 2	670	11.2	493	8.2
OP 4	396	6.6	38	0.6
OP 5	724	12.1	560	9.3
OP 6	890	14.8	764	12.7
OP 7	642	10.7	1,303	21.7
OP 8	881	14.7	154	2.6
OP 22	636	10.6	12	0.2
OP 25	767	12.8	2,757	46.0
OP 26	1,132	18.9	5,133	85.5
OP 27	267	4.5	1,870	31.2
OP 28	232	3.9	1,882	31.4
OP 29	323	5.4	2,163	36.0
OP 30	601	10.0	485	8.1
OP 3	140	2.3	0	0.0
OP 9	252	4.2	0	0.0
OP 23	31	0.5	0	0.0
OP 24	304	5.1	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0

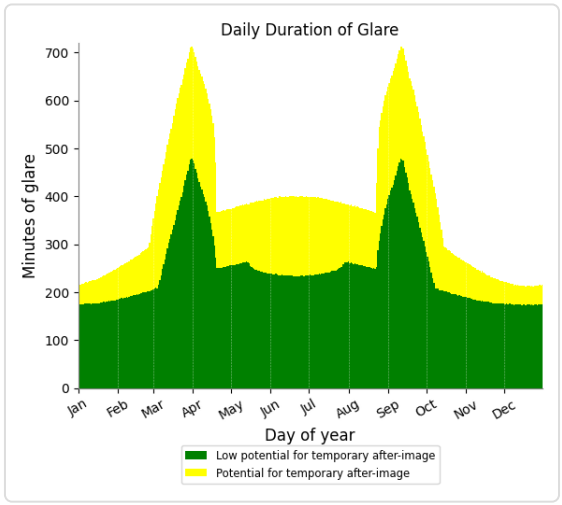
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 21	0	0.0	0	0.0

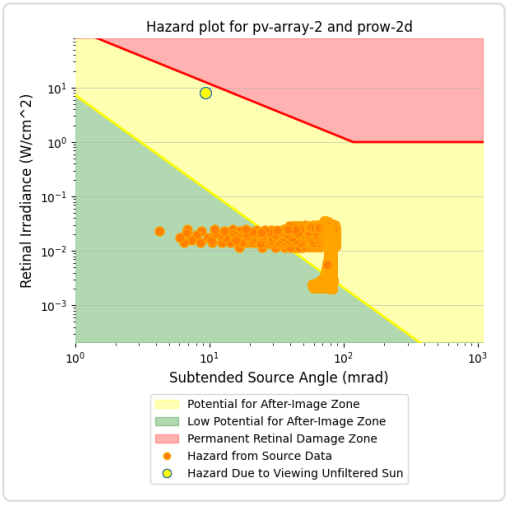
PV array 2 and Route: PRoW 2D

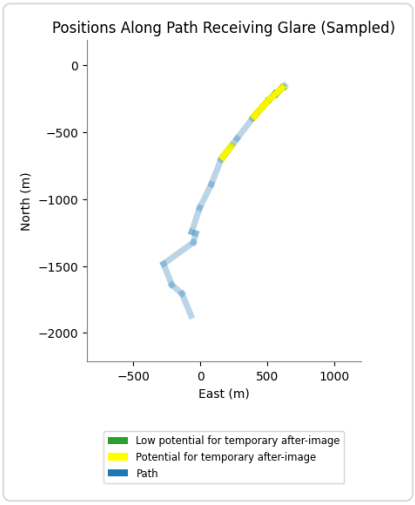
Yellow glare: 48,575 min.

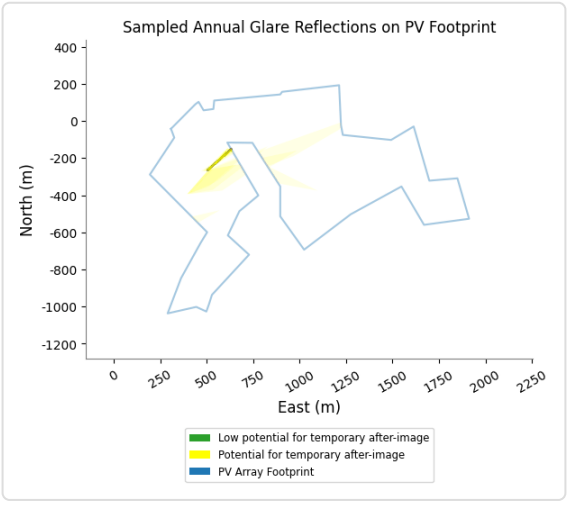
Green glare: 92,063 min.







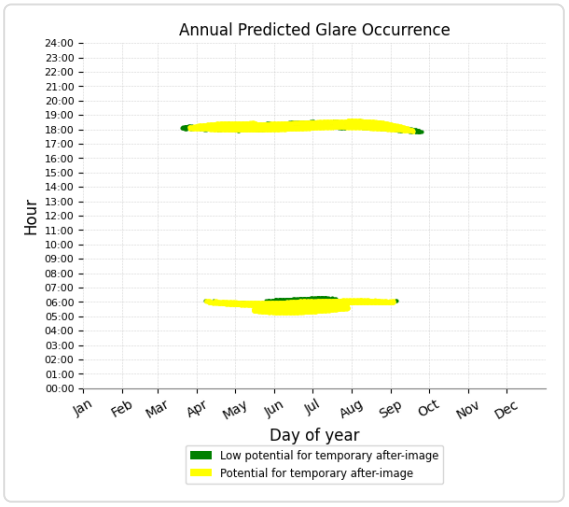


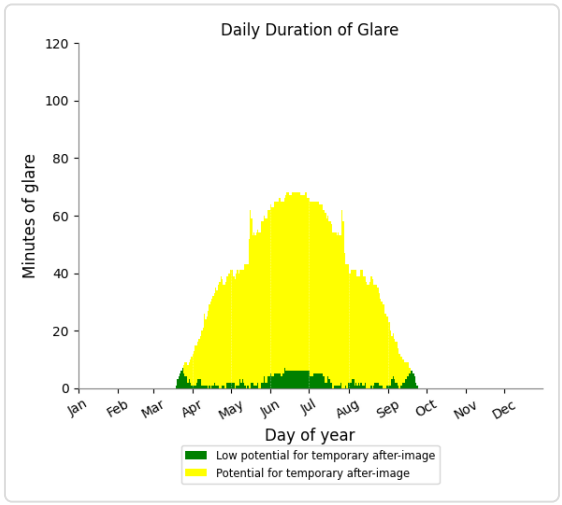


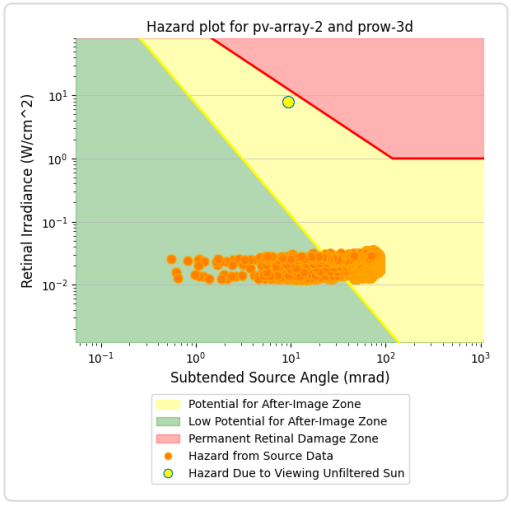
PV array 2 and Route: PRoW 3D

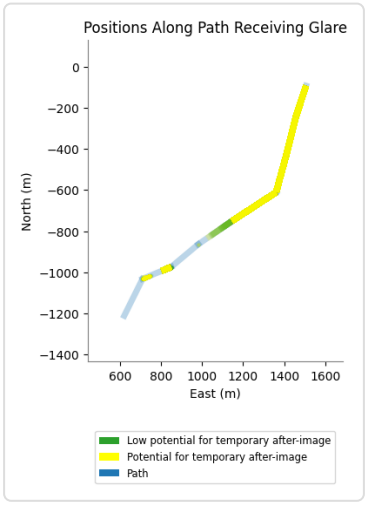
Yellow glare: 7,223 min.

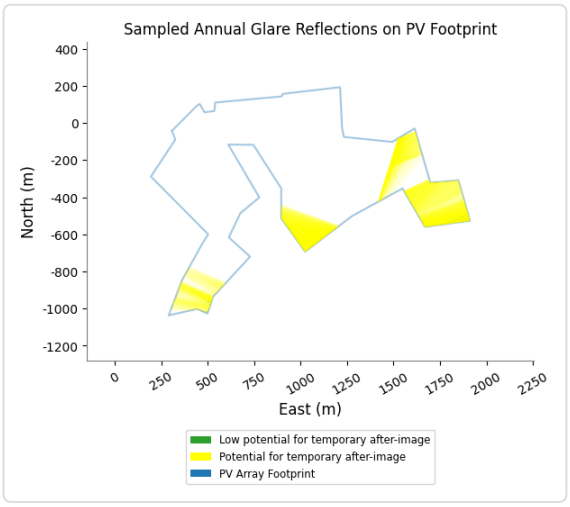
Green glare: 483 min.







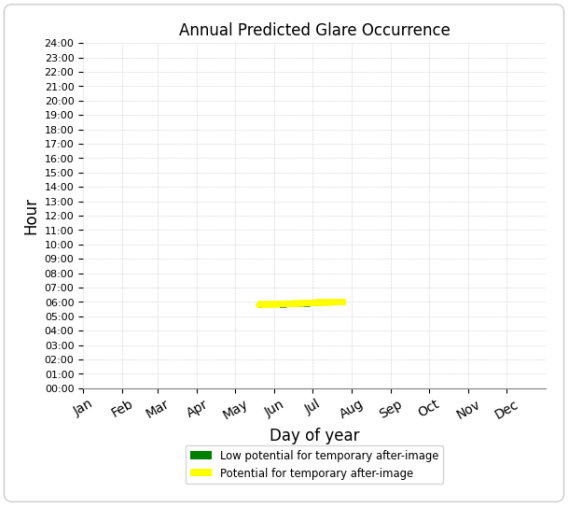


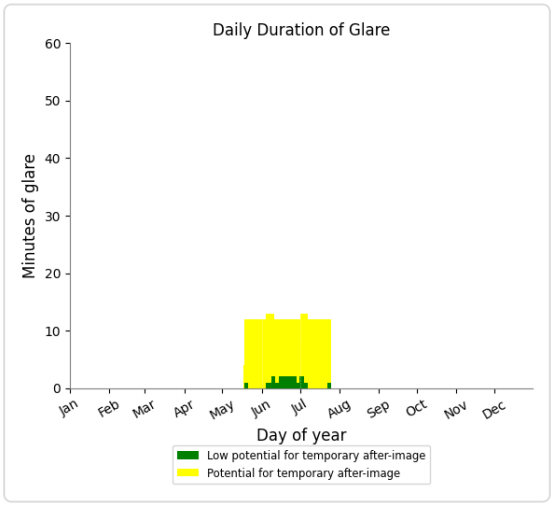


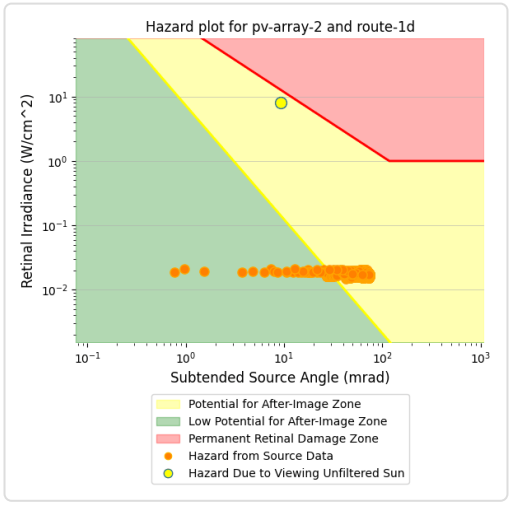
PV array 2 and Route: Route 1D

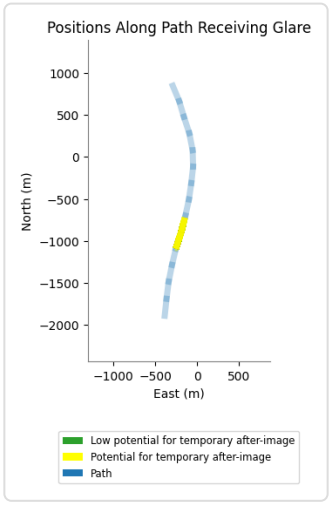
Yellow glare: 772 min.

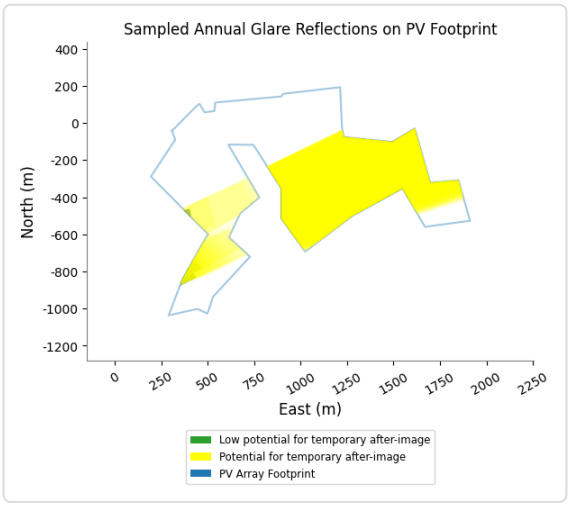
Green glare: 60 min.







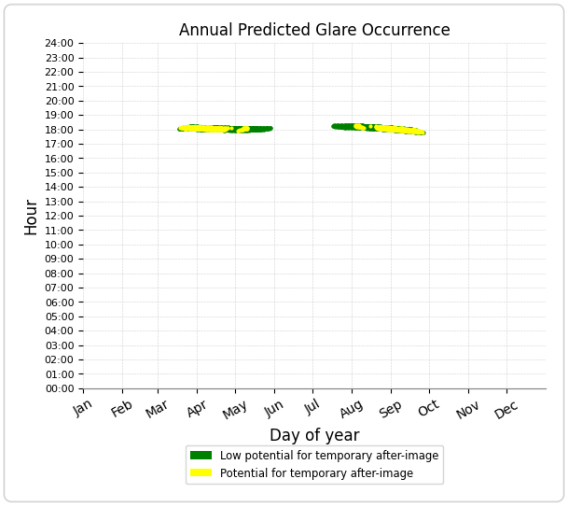


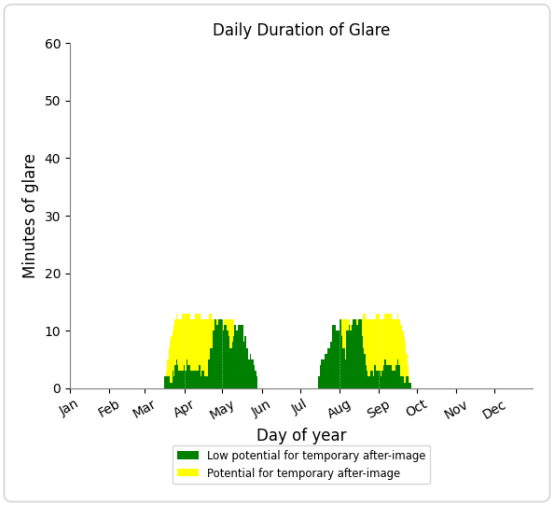


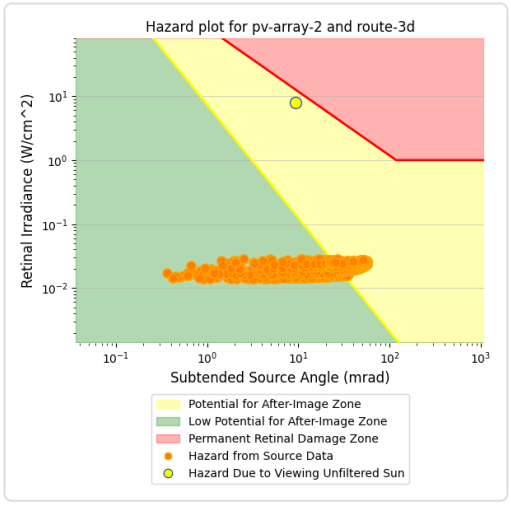
PV array 2 and Route: Route 3D

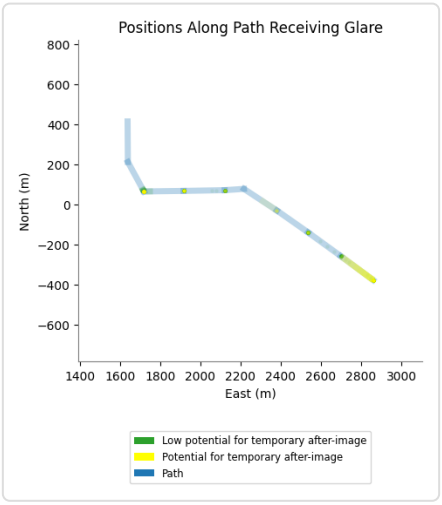
Yellow glare: 667 min.

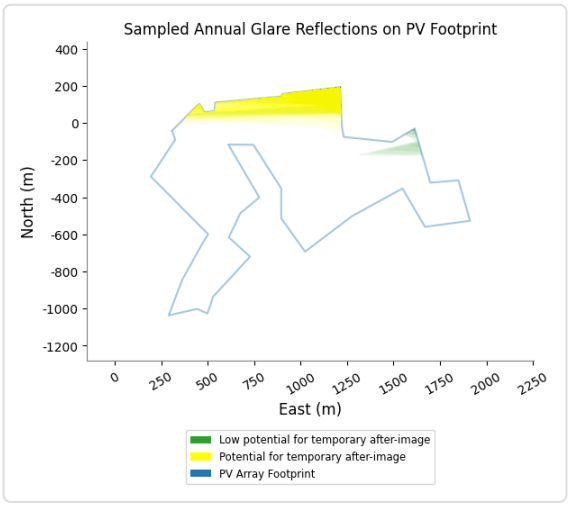
Green glare: 862 min.







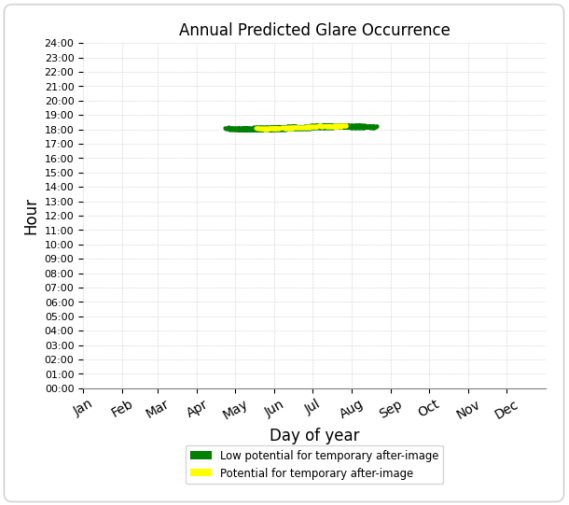


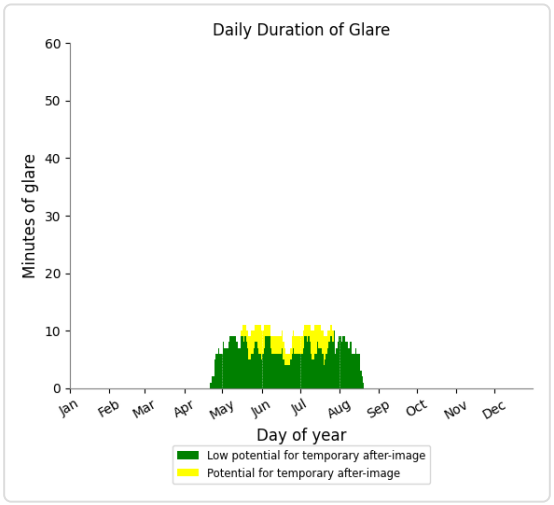


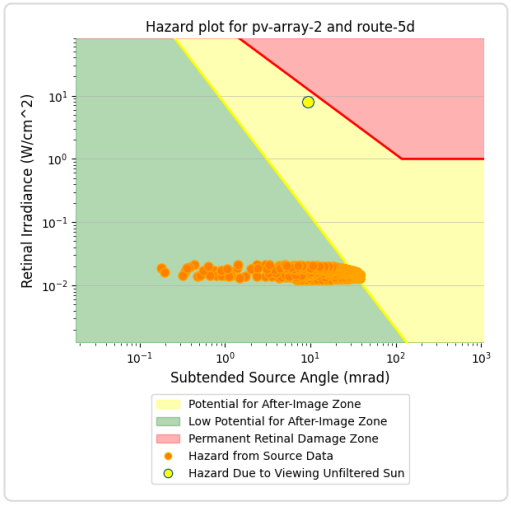
PV array 2 and Route: Route 5D

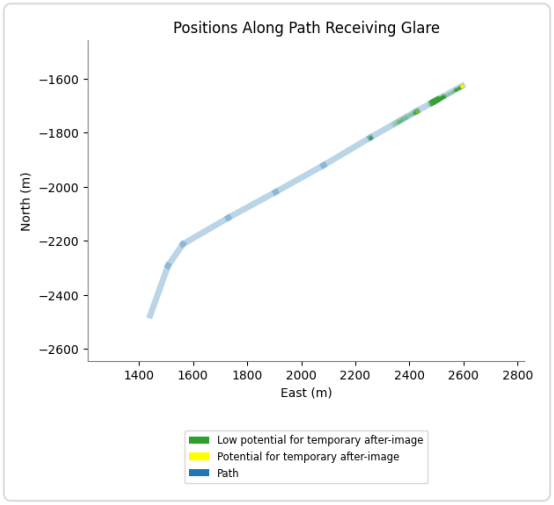
Yellow glare: 225 min.

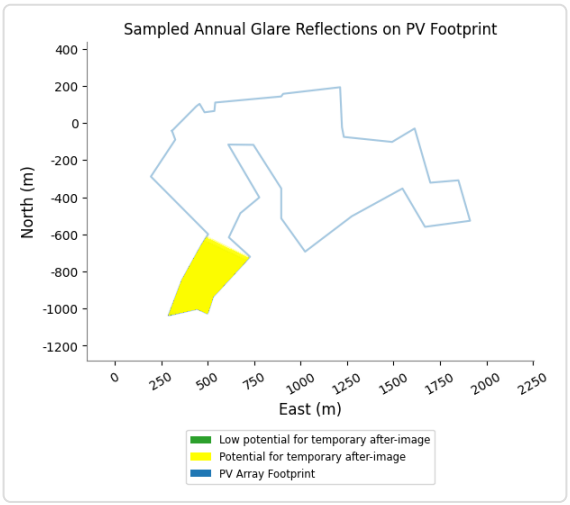
Green glare: 805 min.











PV array 2 and Route: PRoW 1D

No glare found

PV array 2 and Route: PRoW 4D

No glare found

PV array 2 and Route: Route 2D

No glare found

PV array 2 and Route: Route 4D

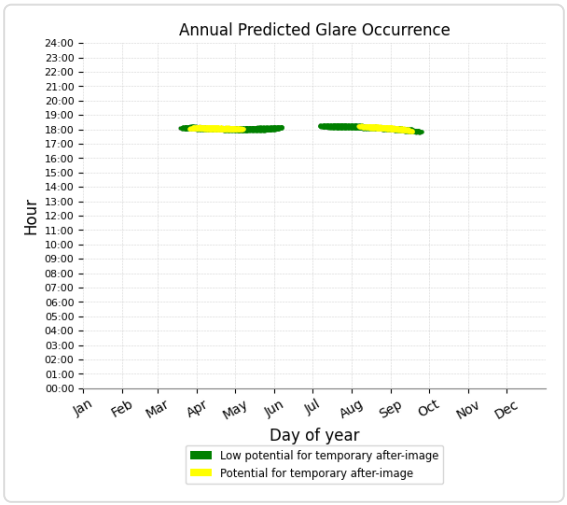
No glare found

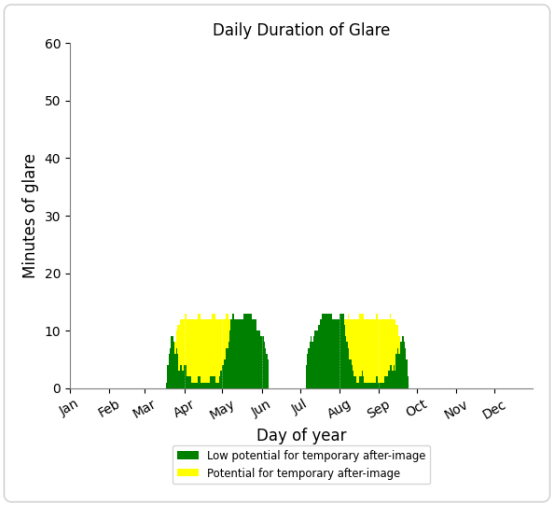
PV array 2 and Route: Route 6D

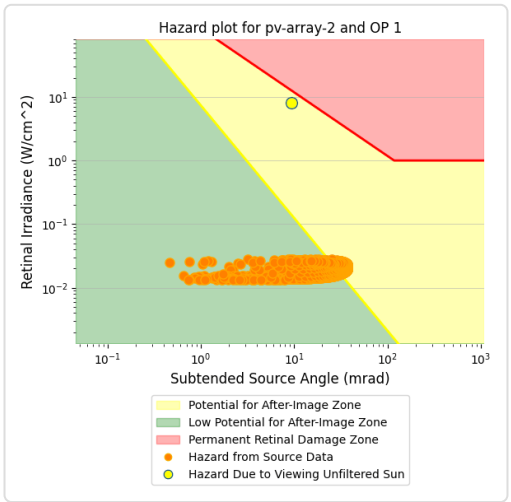
No glare found

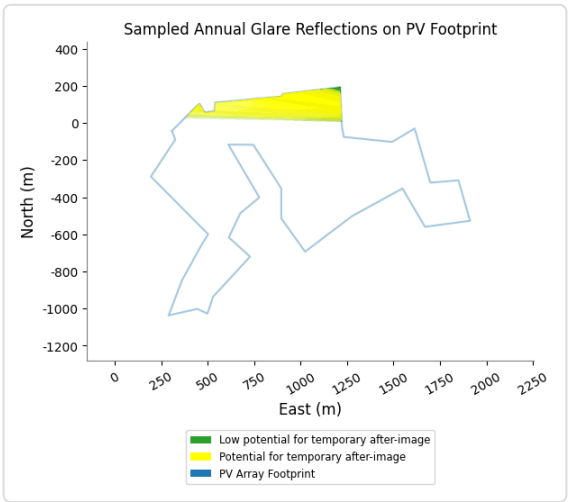
PV array 2 and OP 1

Yellow glare: 801 min.
Green glare: 1,012 min.





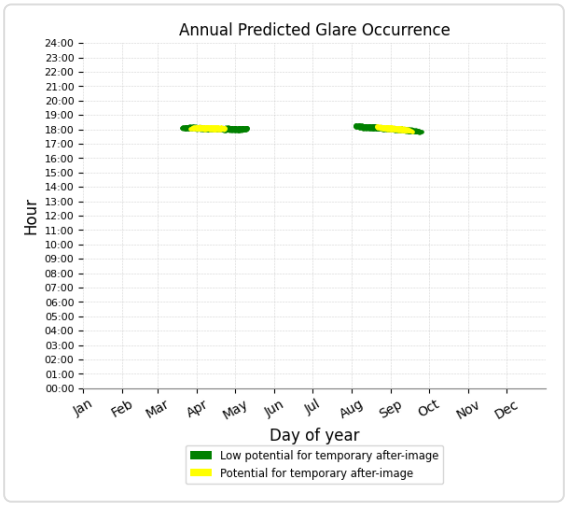


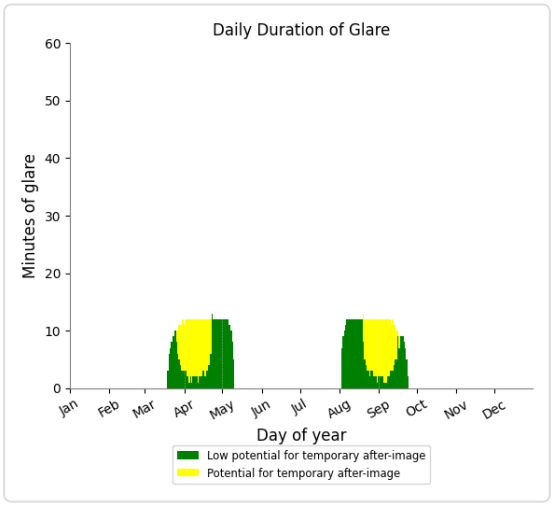


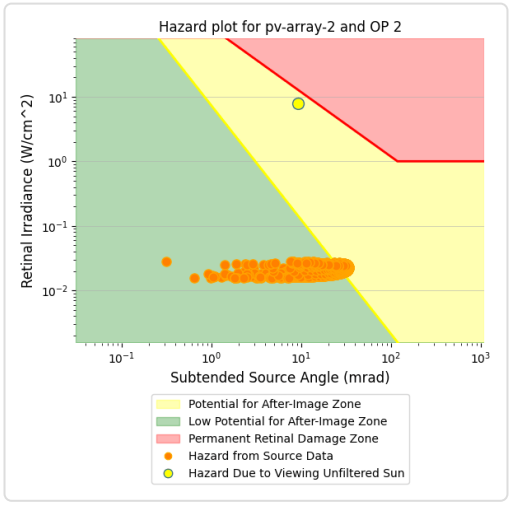
PV array 2 and OP 2

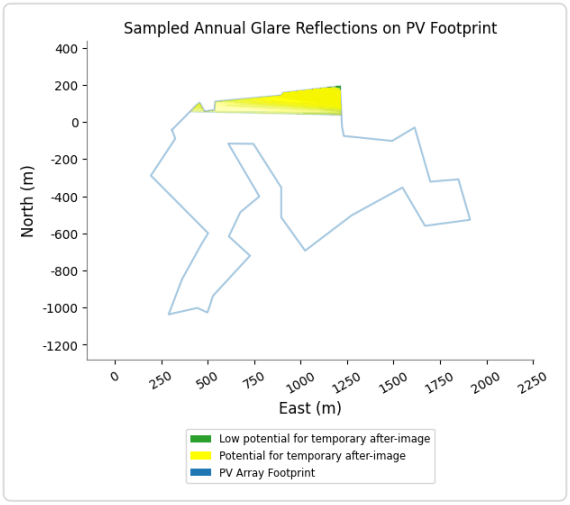
Yellow glare: 493 min.

Green glare: 670 min.





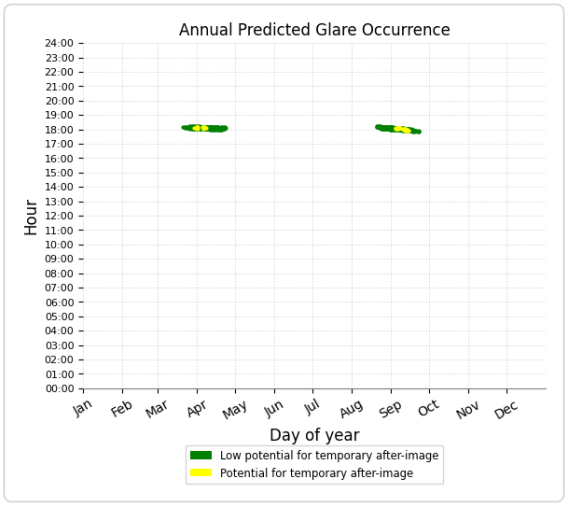


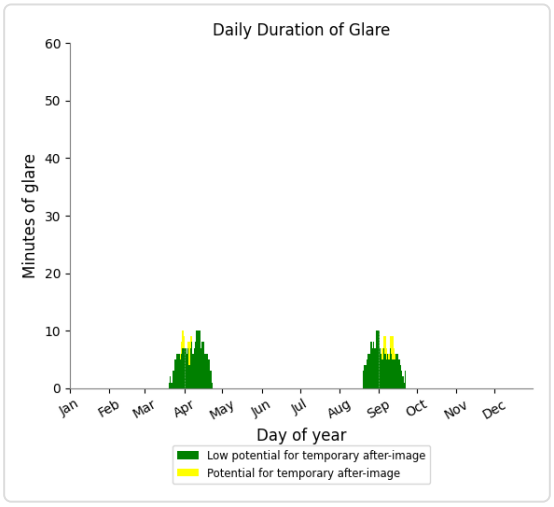


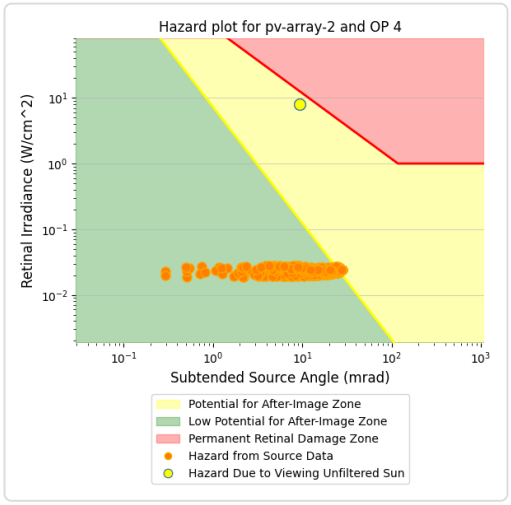
PV array 2 and OP 4

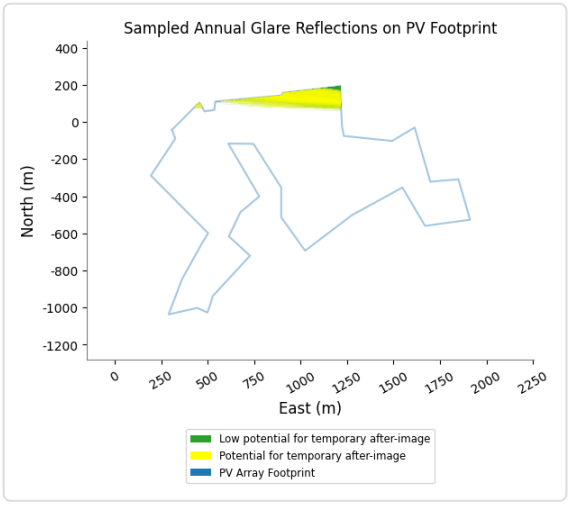
Yellow glare: 38 min.

Green glare: 396 min.





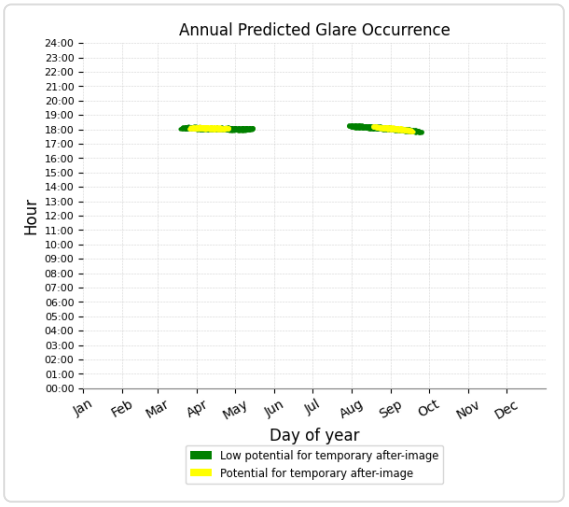


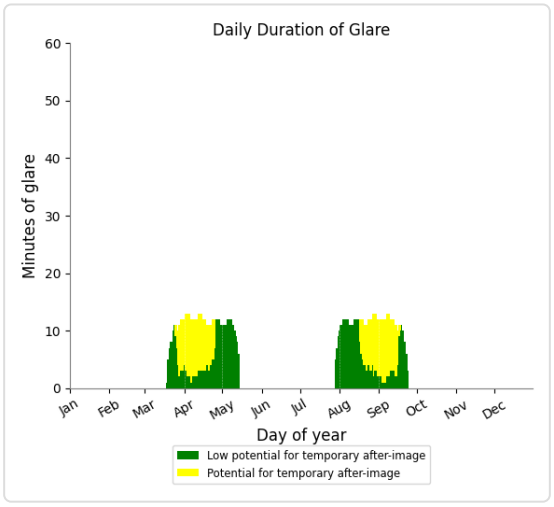


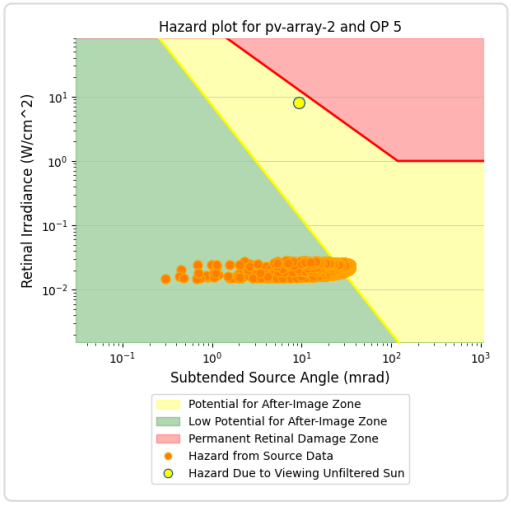
PV array 2 and OP 5

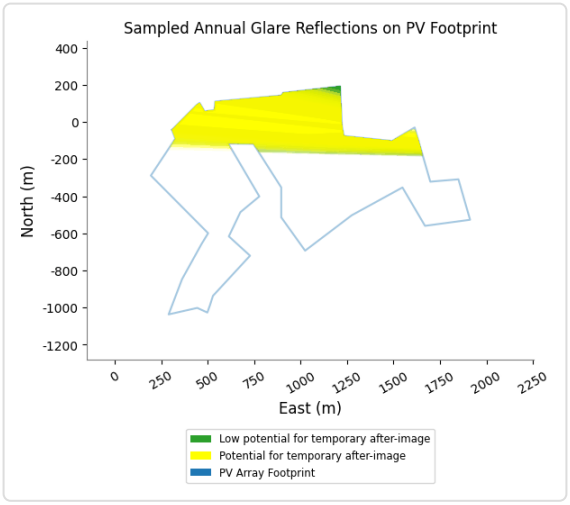
Yellow glare: 560 min.

Green glare: 724 min.





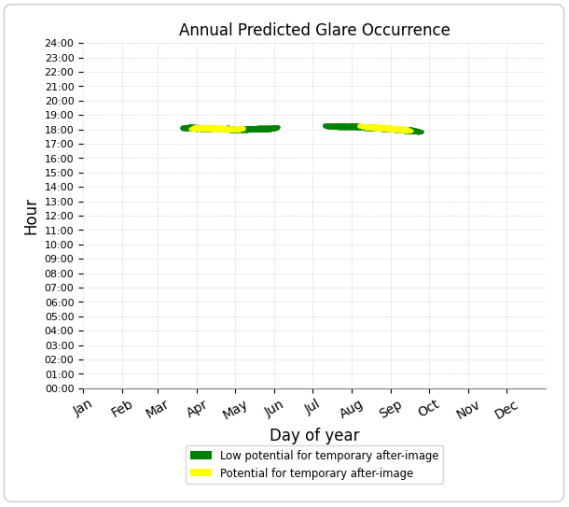


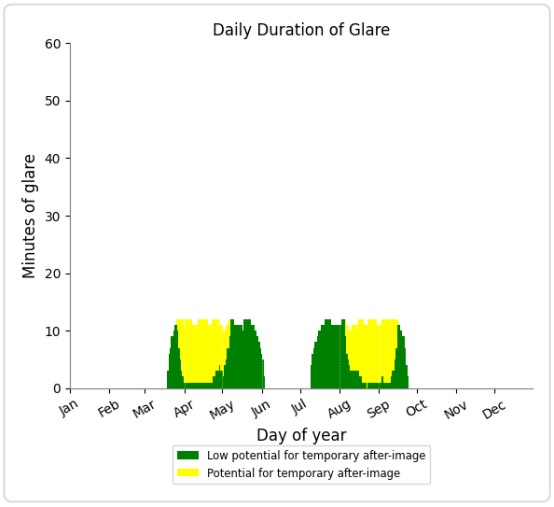


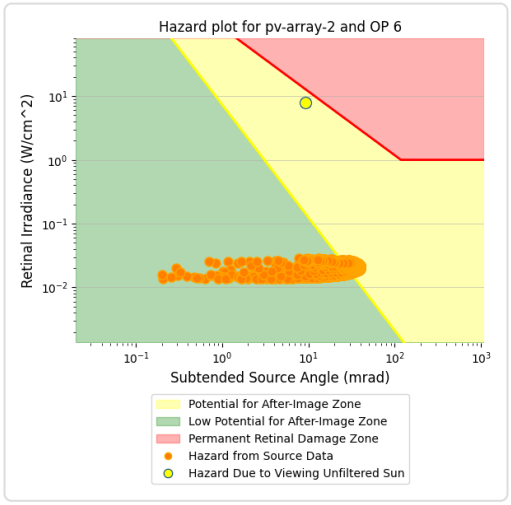
PV array 2 and OP 6

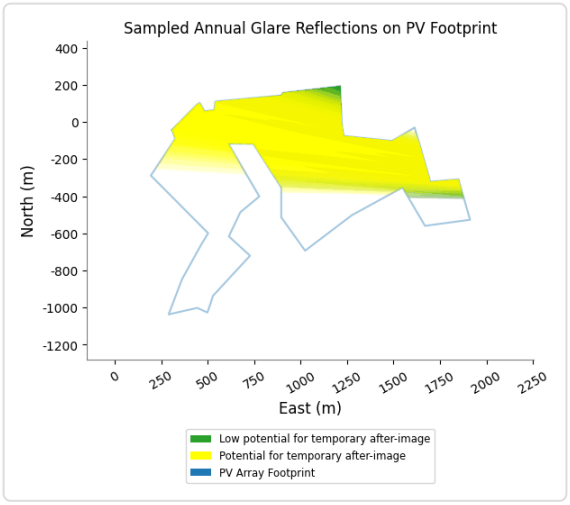
Yellow glare: 764 min.

Green glare: 890 min.





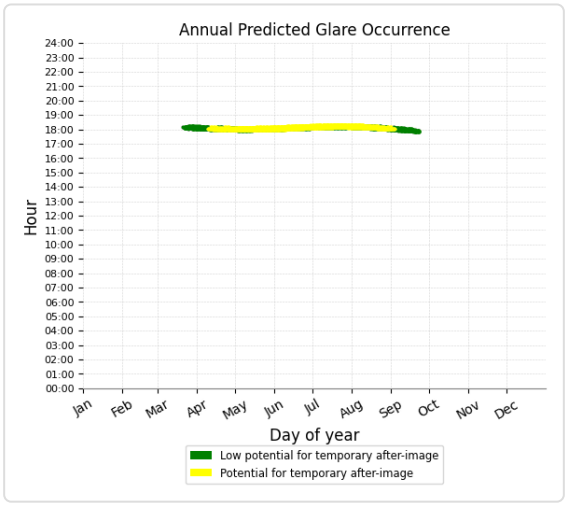


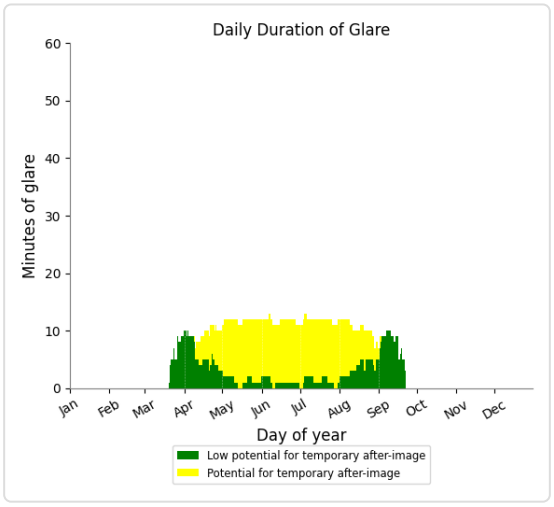


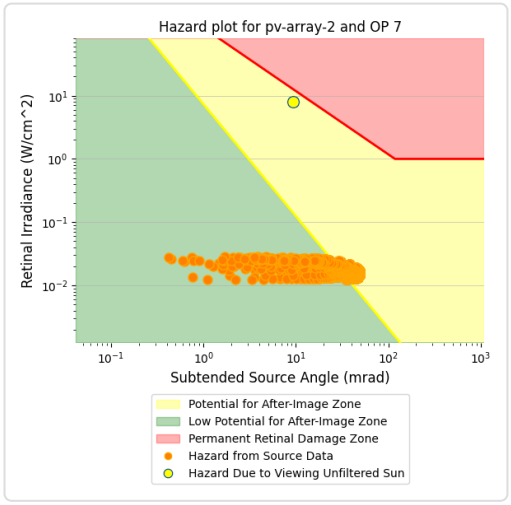
PV array 2 and OP 7

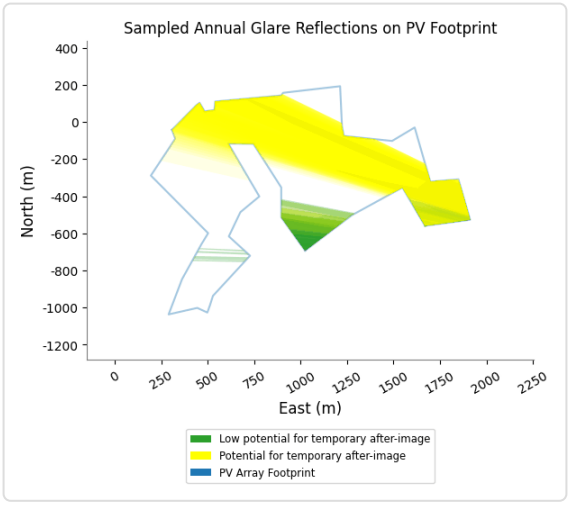
Yellow glare: 1,303 min.

Green glare: 642 min.





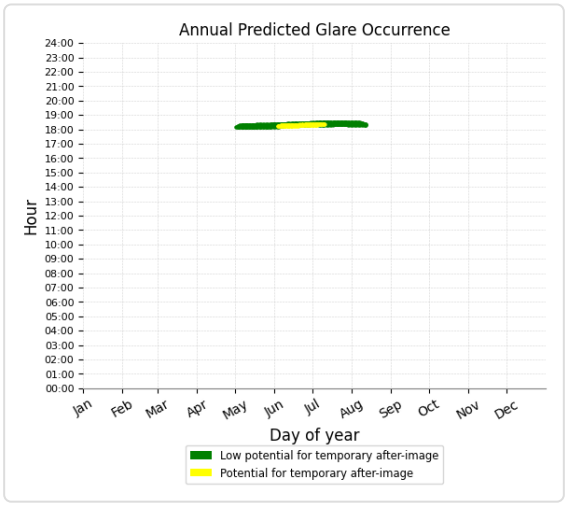


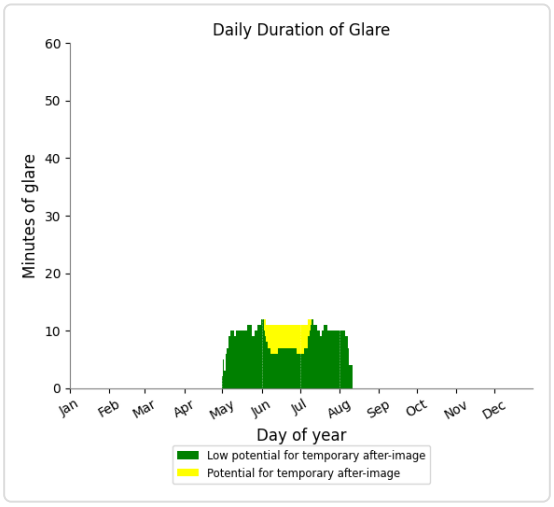


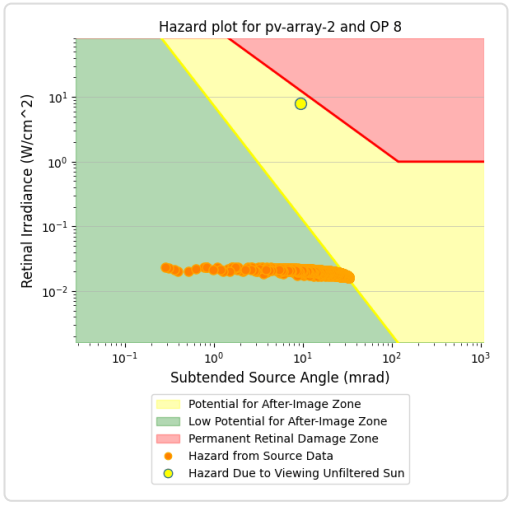
PV array 2 and OP 8

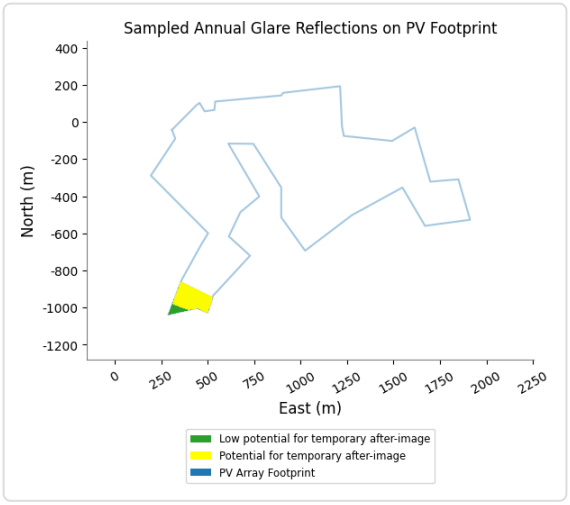
Yellow glare: 154 min.

Green glare: 881 min.





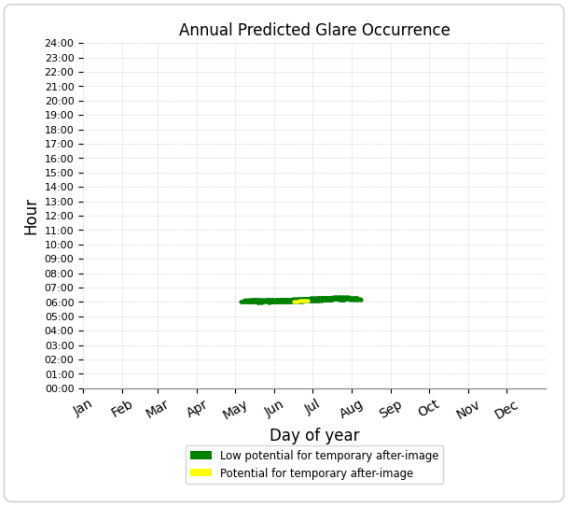


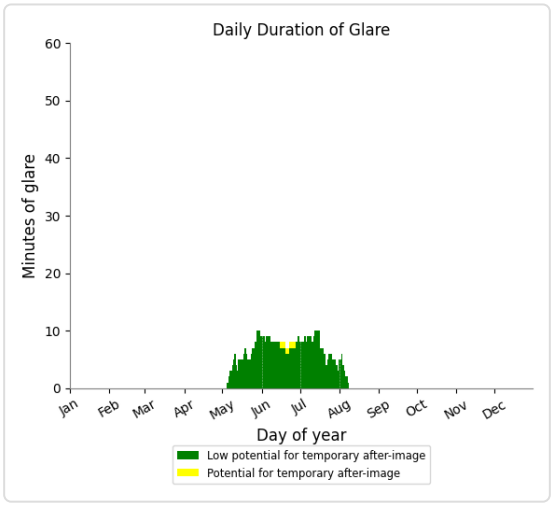


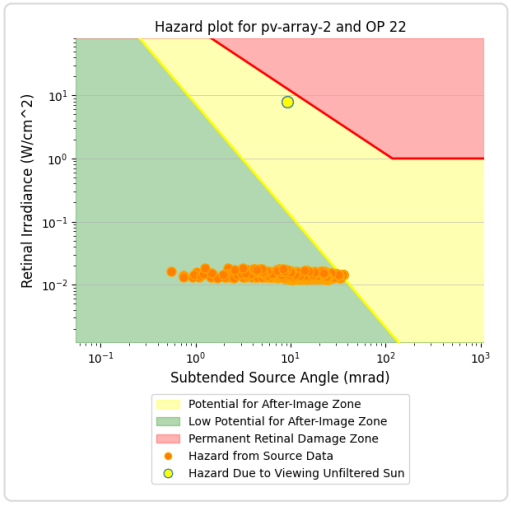
PV array 2 and OP 22

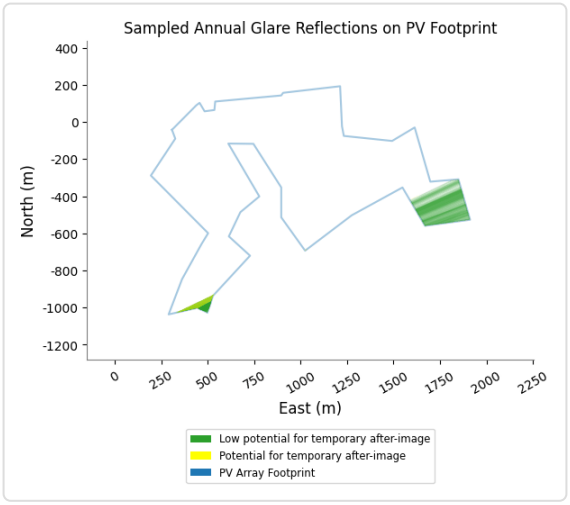
Yellow glare: 12 min.

Green glare: 636 min.





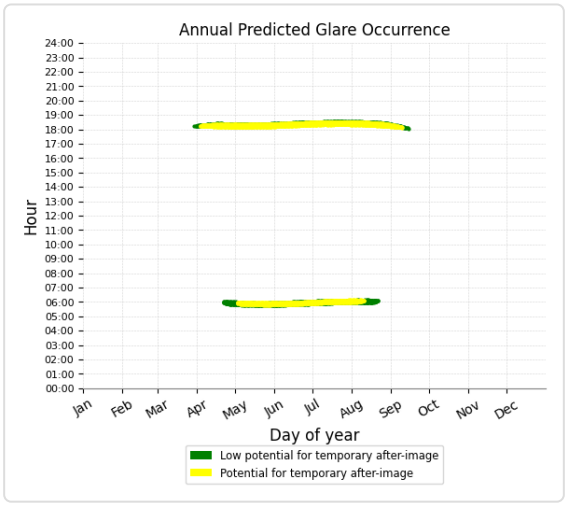


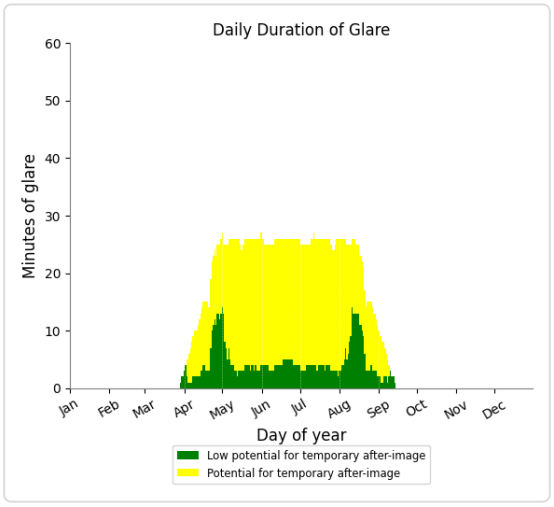


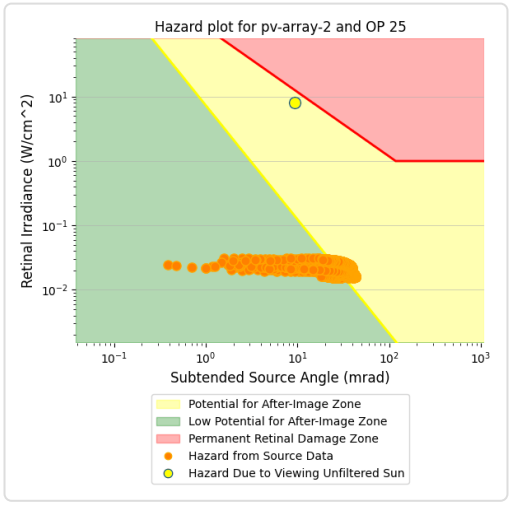
PV array 2 and OP 25

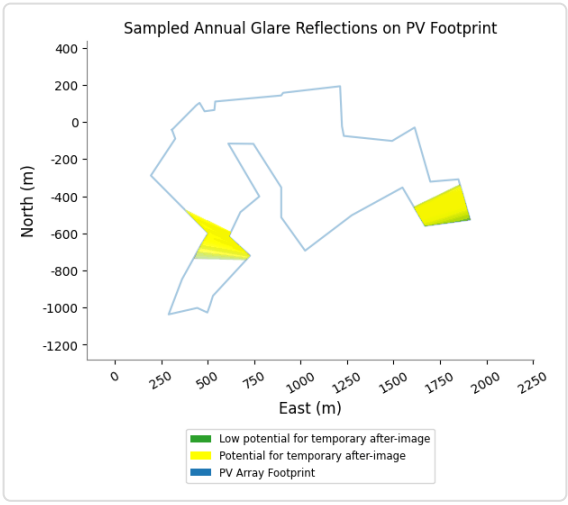
Yellow glare: 2,757 min.

Green glare: 767 min.





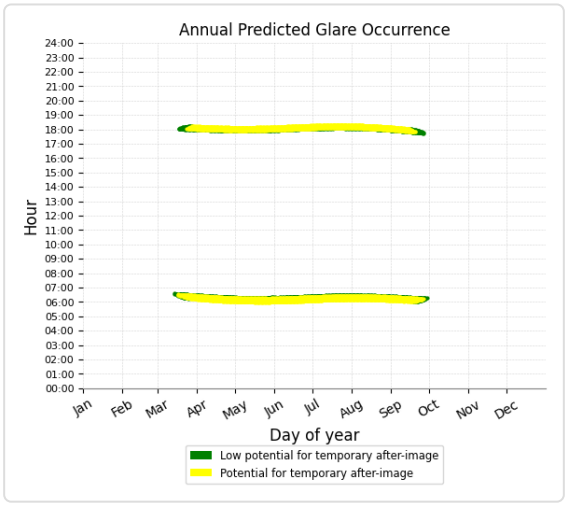


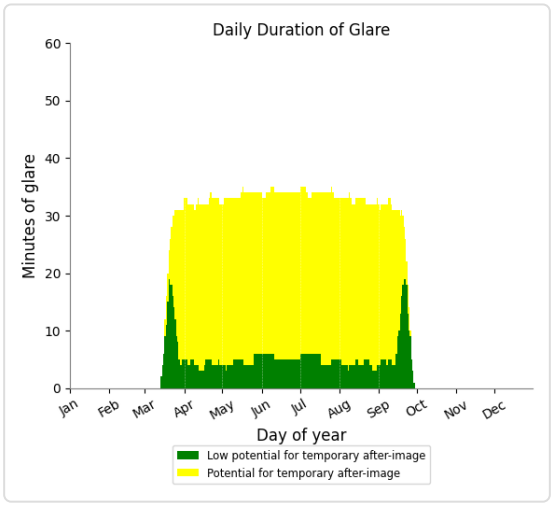


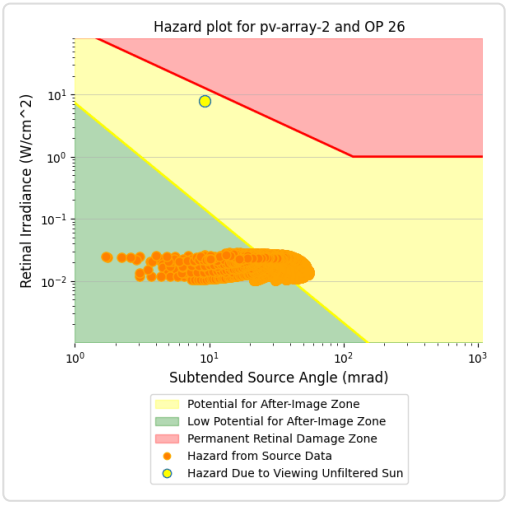
PV array 2 and OP 26

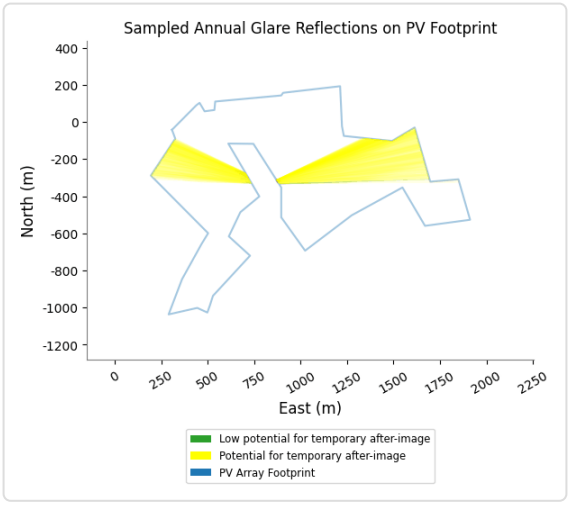
Yellow glare: 5,133 min.

Green glare: 1,132 min.





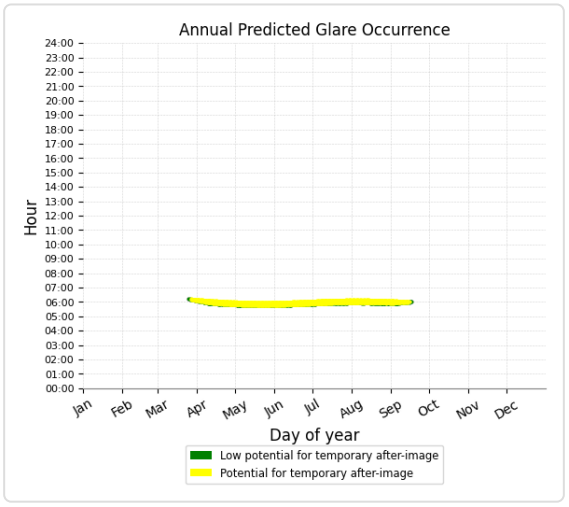


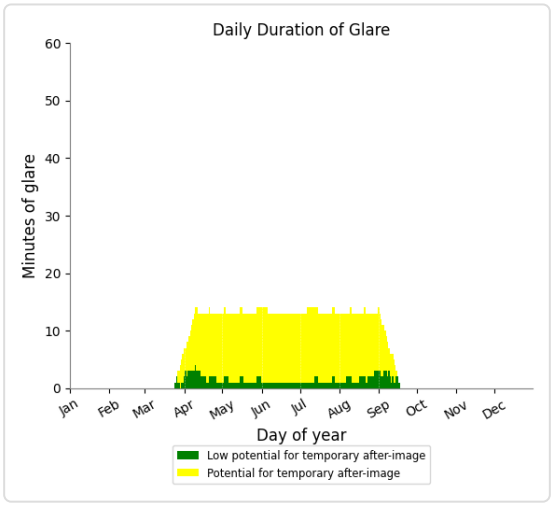


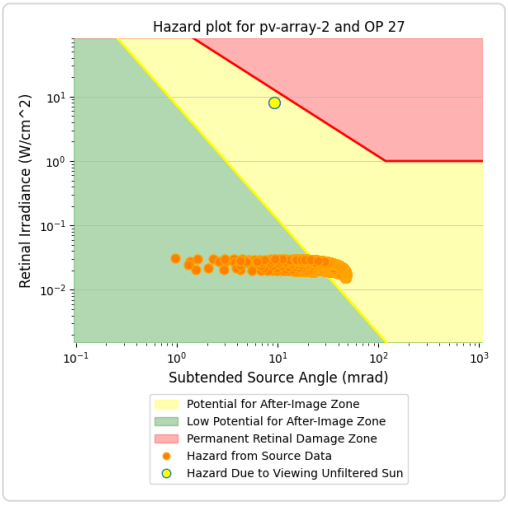
PV array 2 and OP 27

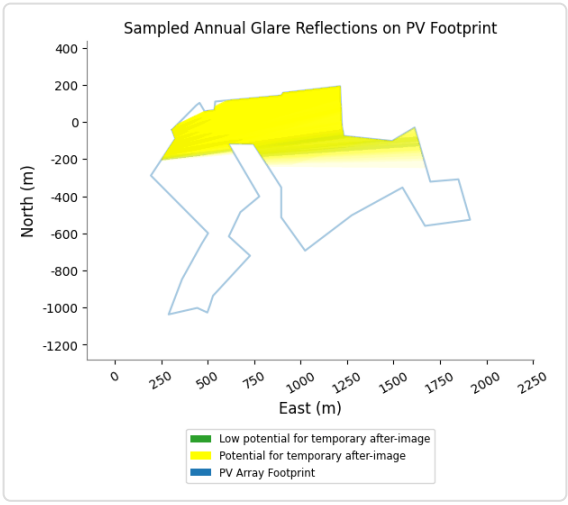
Yellow glare: 1,870 min.

Green glare: 267 min.





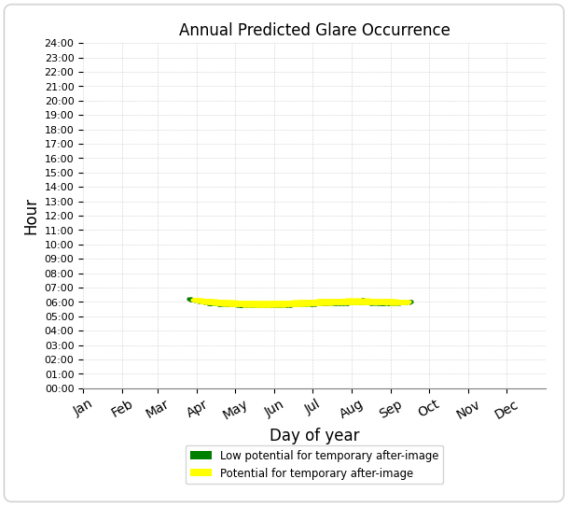


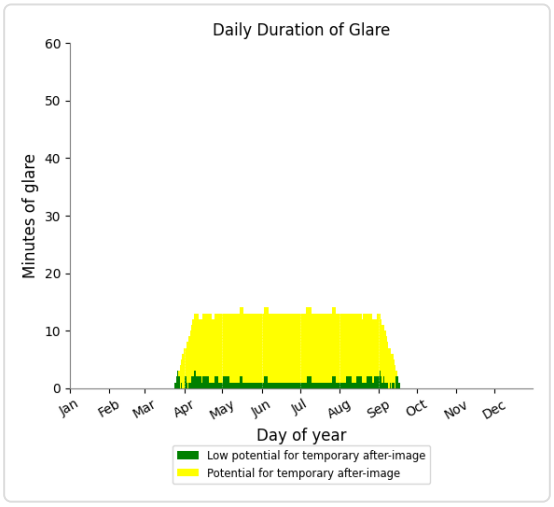


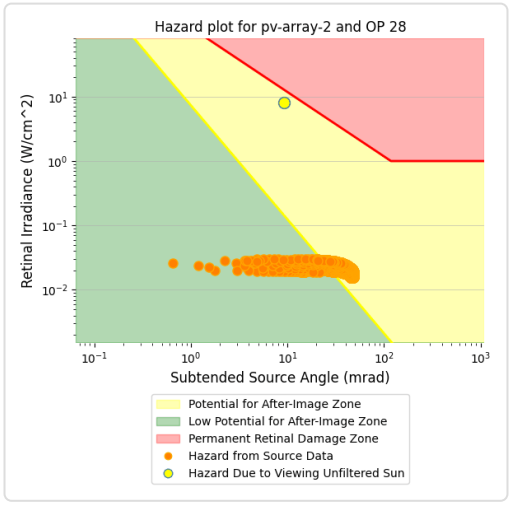
PV array 2 and OP 28

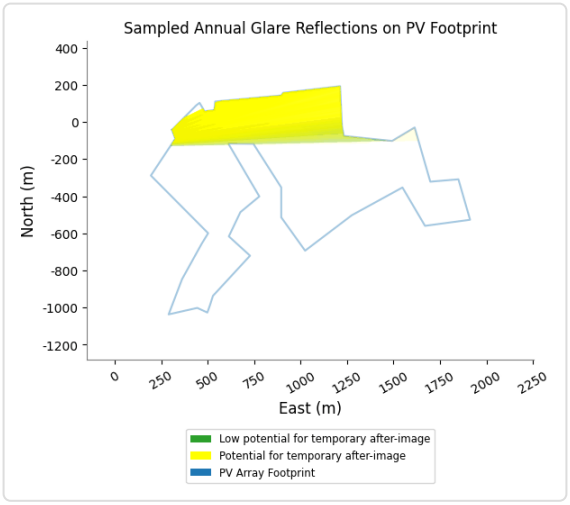
Yellow glare: 1,882 min.

Green glare: 232 min.





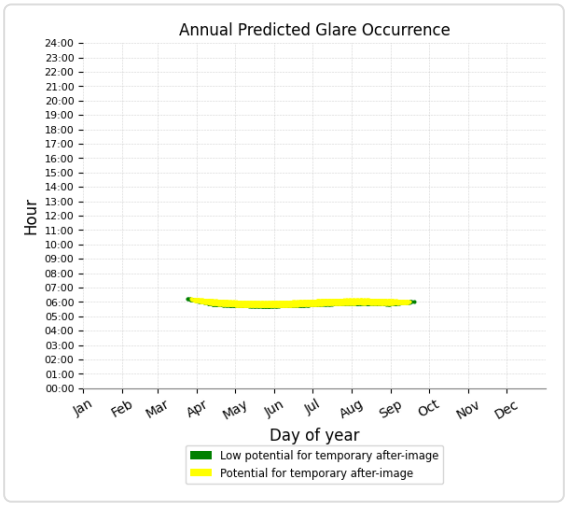


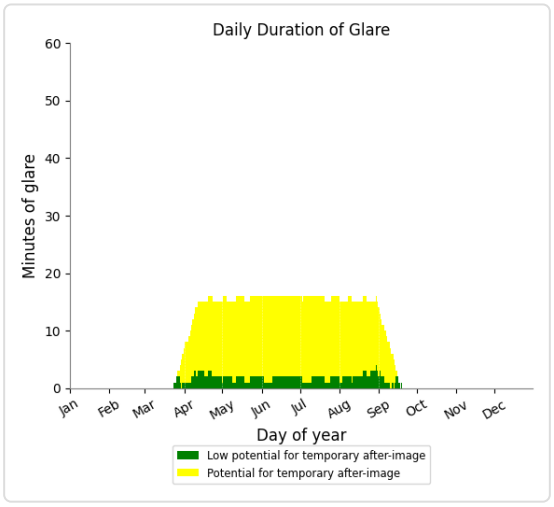


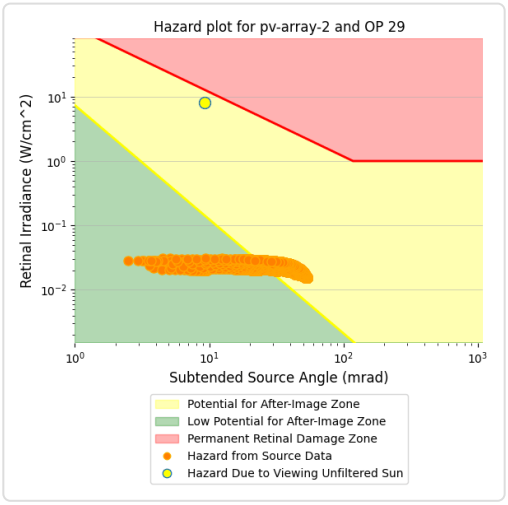
PV array 2 and OP 29

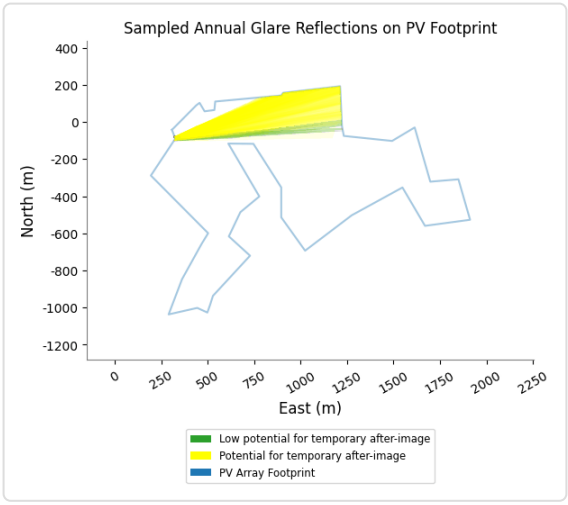
Yellow glare: 2,163 min.

Green glare: 323 min.





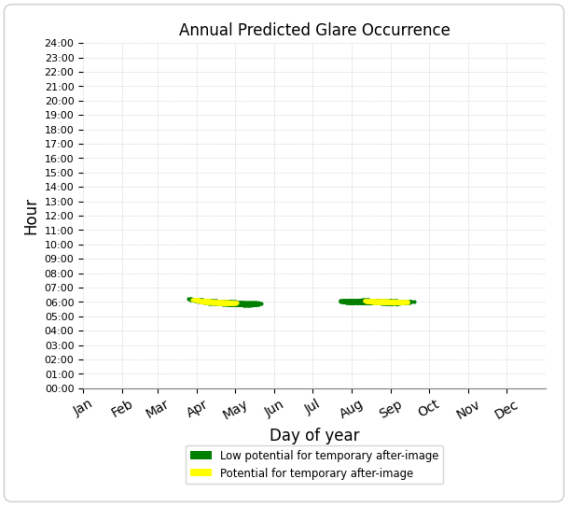


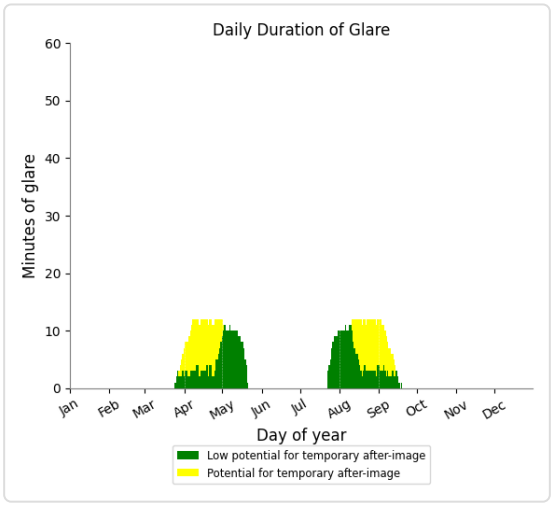


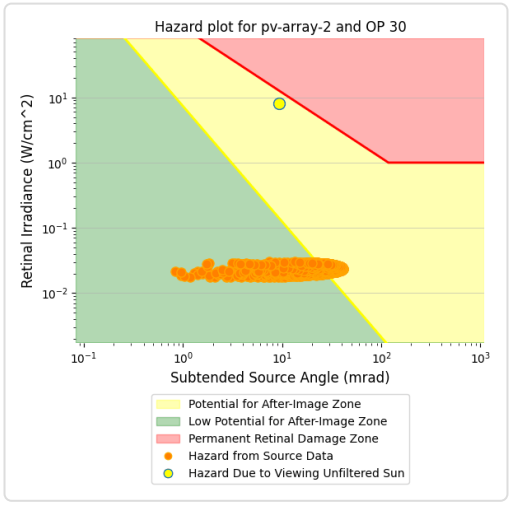
PV array 2 and OP 30

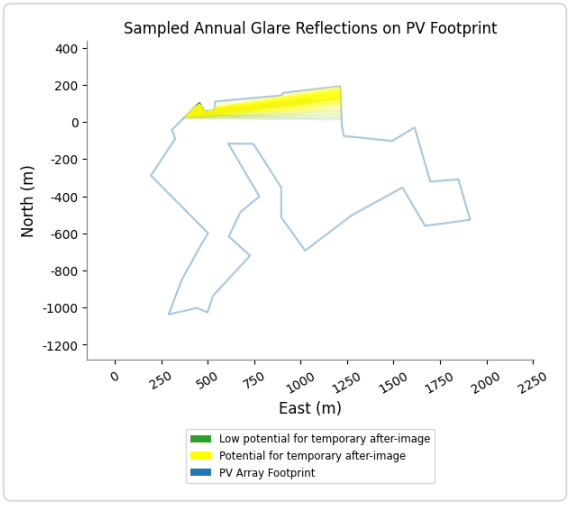
Yellow glare: 485 min.

Green glare: 601 min.





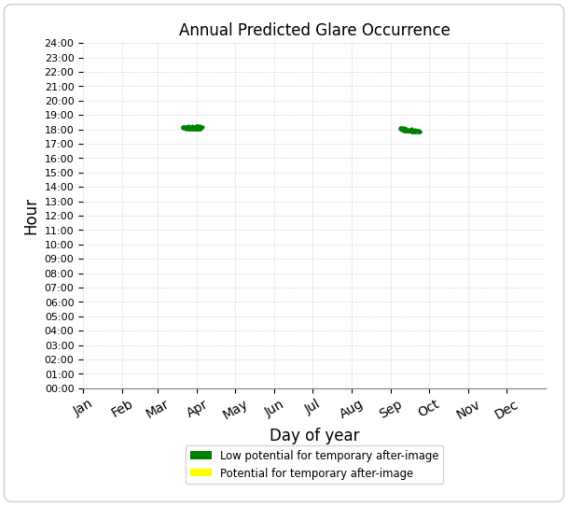


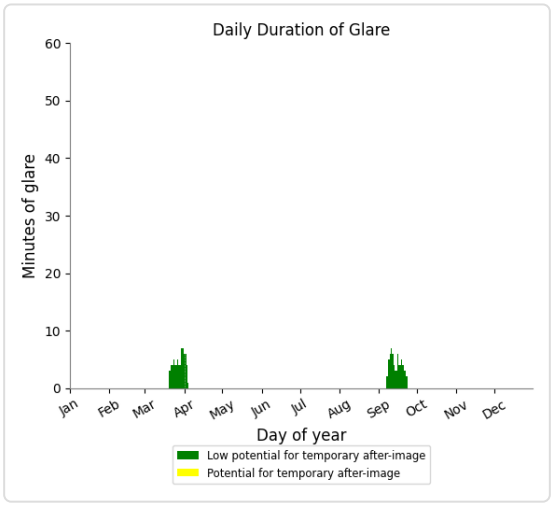


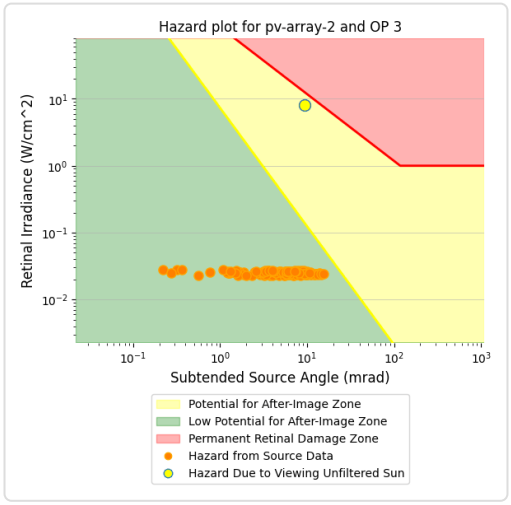
PV array 2 and OP 3

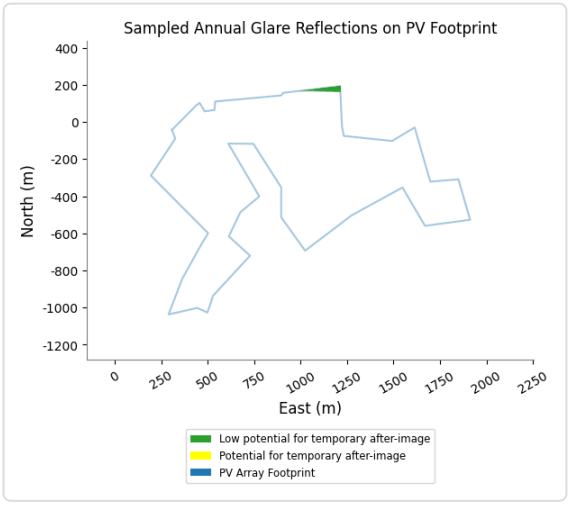
Yellow glare: none

Green glare: 140 min.





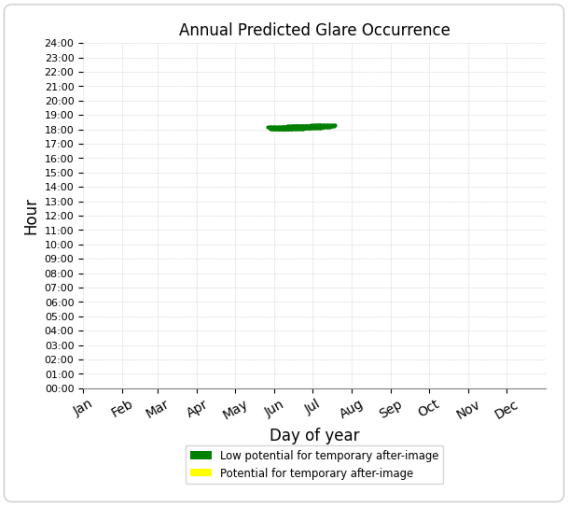


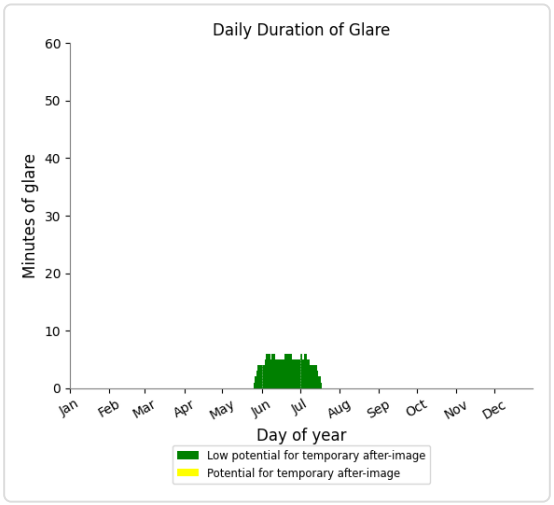


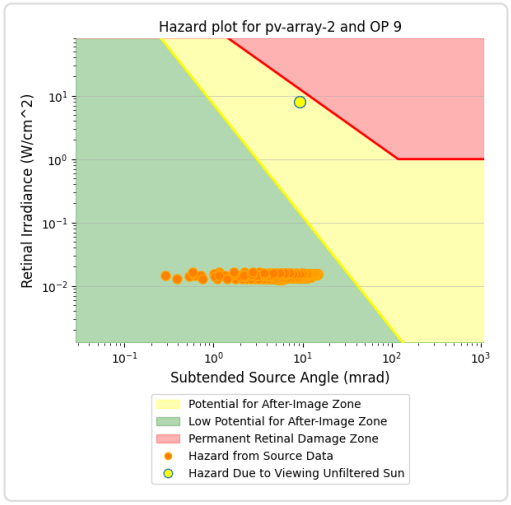
PV array 2 and OP 9

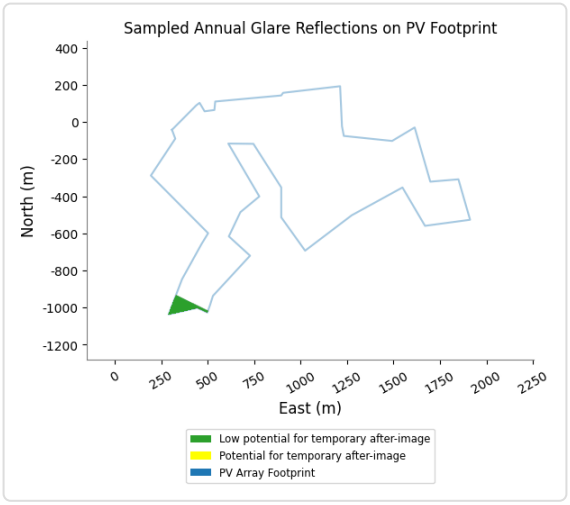
Yellow glare: none

Green glare: 252 min.





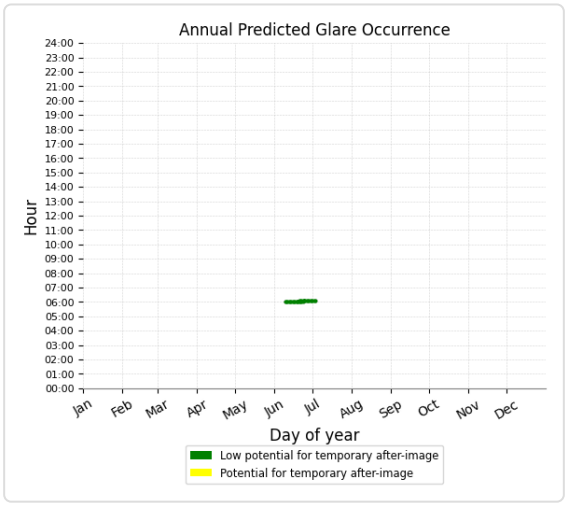


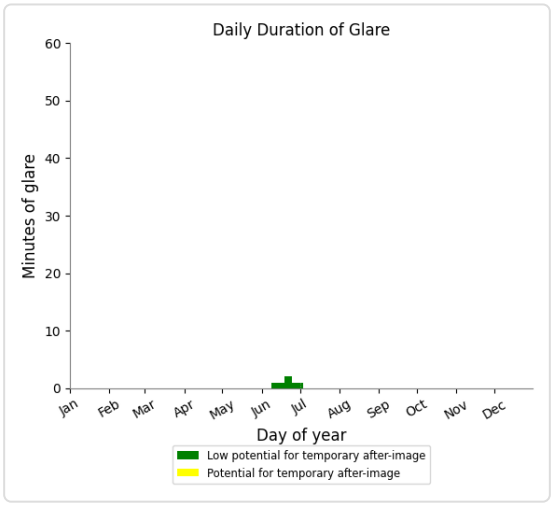


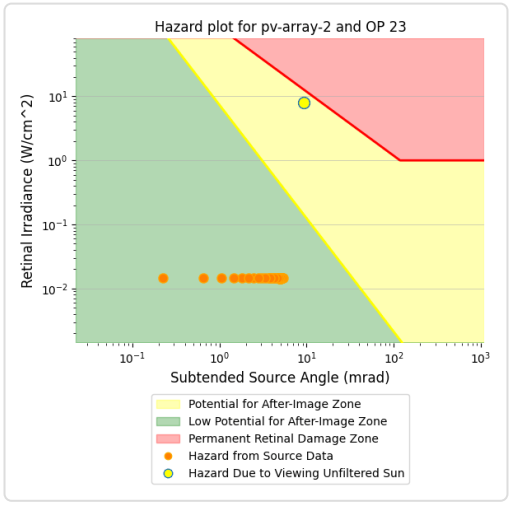
PV array 2 and OP 23

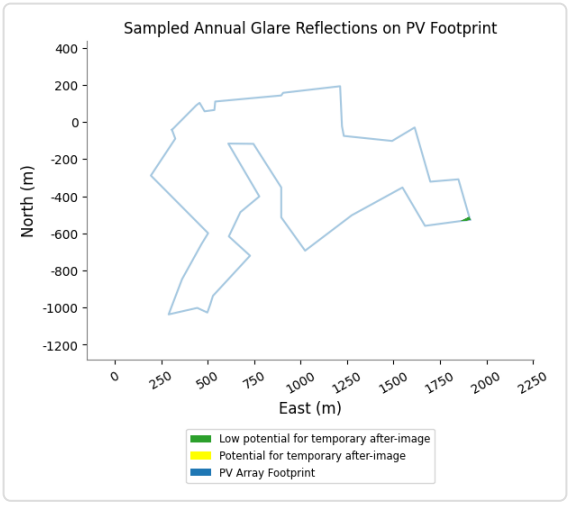
Yellow glare: none

Green glare: 31 min.





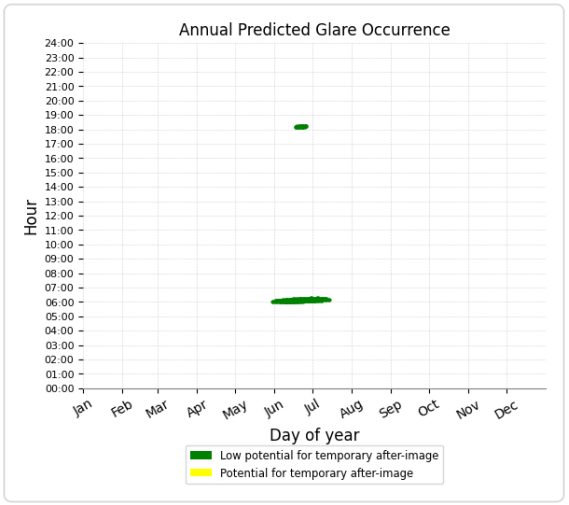


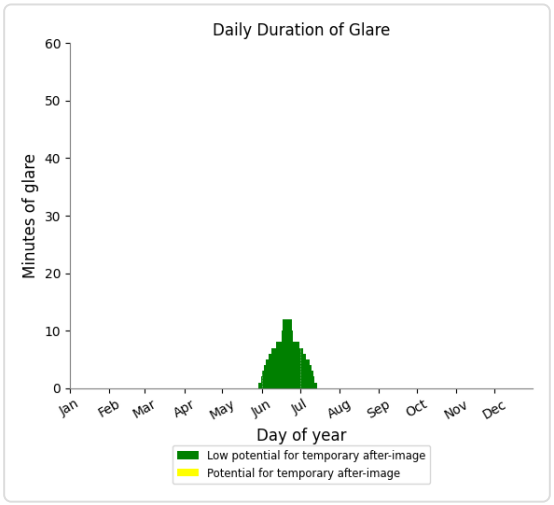


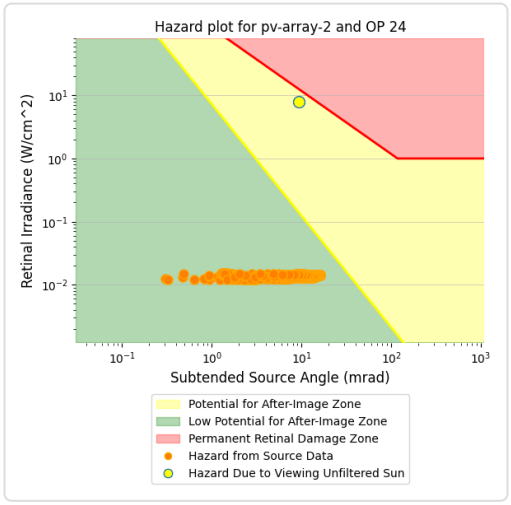
PV array 2 and OP 24

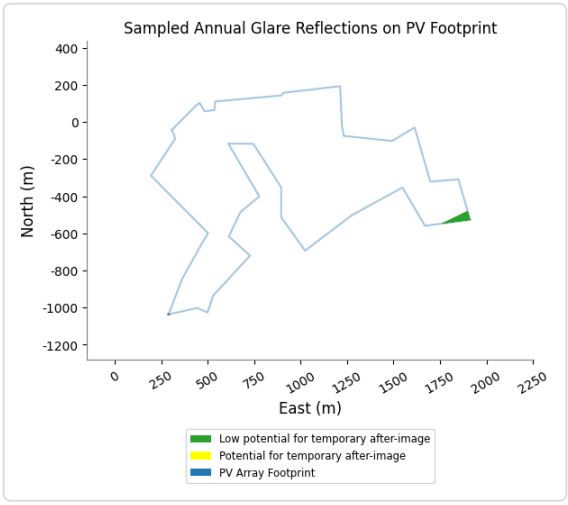
Yellow glare: none

Green glare: 304 min.









PV array 2 and OP 10

No glare found

PV array 2 and OP 11

No glare found

PV array 2 and OP 12

No glare found

PV array 2 and OP 13

No glare found

PV array 2 and OP 14

No glare found

PV array 2 and OP 15

No glare found

PV array 2 and OP 16

No glare found

PV array 2 and OP 17

No glare found

PV array 2 and OP 18

No glare found

PV array 2 and OP 19

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 21

No glare found

PV: PV array 3 potential temporary after-image

Receptor results ordered by category of glare

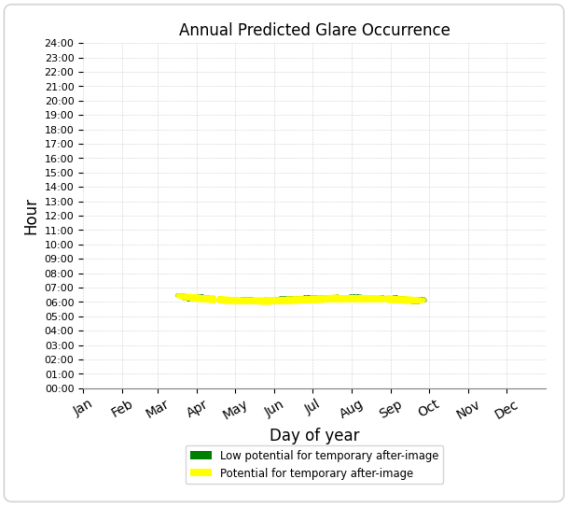
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1D	118	2.0	2,477	41.3
PRoW 2D	479	8.0	847	14.1
PRoW 3D	482	8.0	379	6.3
Route 4D	1,621	27.0	735	12.2
Route 5D	676	11.3	3,352	55.9
PRoW 4D	0	0.0	0	0.0
Route 1D	0	0.0	0	0.0
Route 2D	0	0.0	0	0.0
Route 3D	0	0.0	0	0.0
Route 6D	0	0.0	0	0.0
OP 8	626	10.4	879	14.7
OP 9	732	12.2	990	16.5
OP 10	469	7.8	1,573	26.2
OP 18	1,156	19.3	154	2.6
OP 19	1,051	17.5	3,395	56.6
OP 20	634	10.6	1,749	29.1
OP 21	594	9.9	310	5.2
OP 23	656	10.9	771	12.8
OP 24	780	13.0	115	1.9
OP 12	138	2.3	0	0.0
OP 22	577	9.6	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

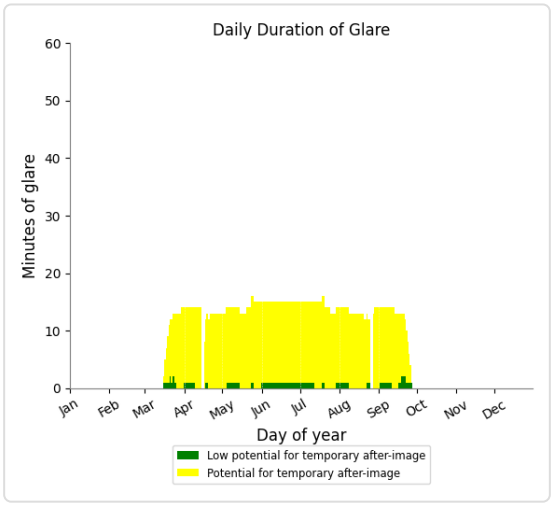
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 30	0	0.0	0	0.0

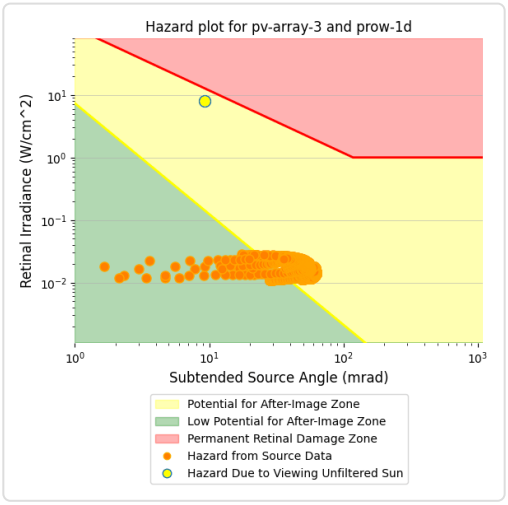
PV array 3 and Route: PRoW 1D

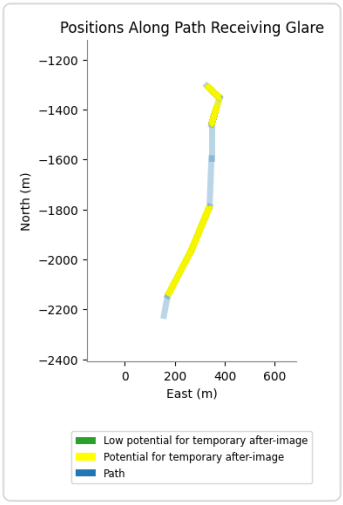
Yellow glare: 2,477 min.

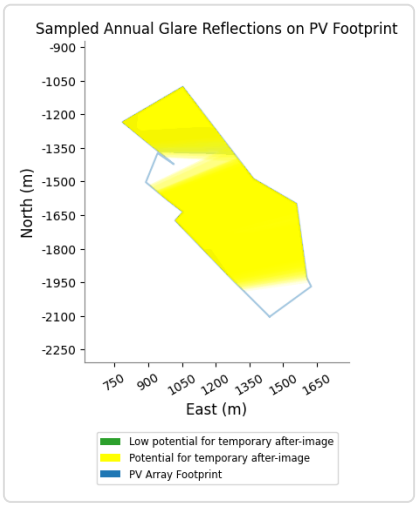
Green glare: 118 min.







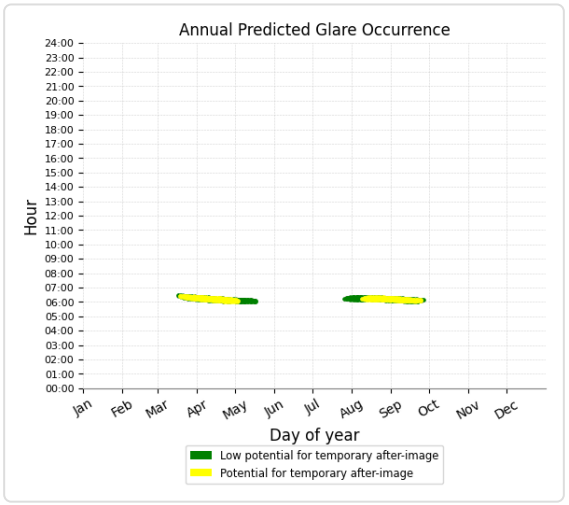


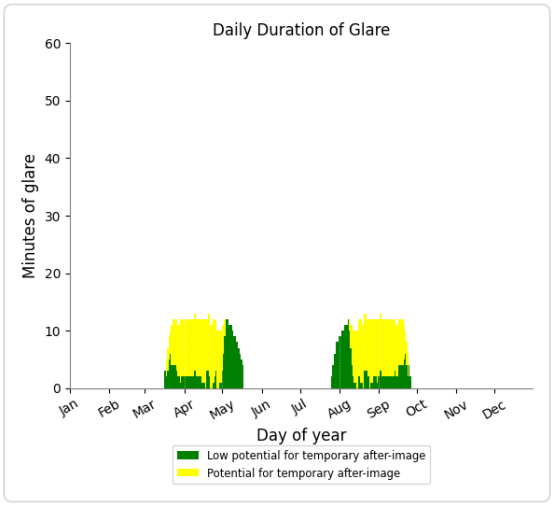


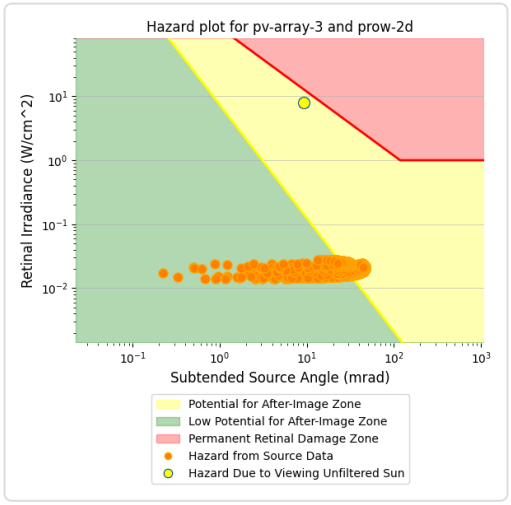
PV array 3 and Route: PRoW 2D

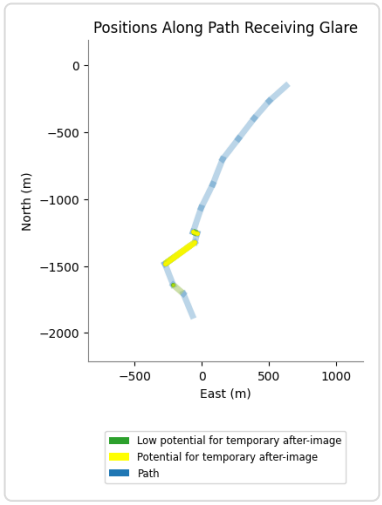
Yellow glare: 847 min.

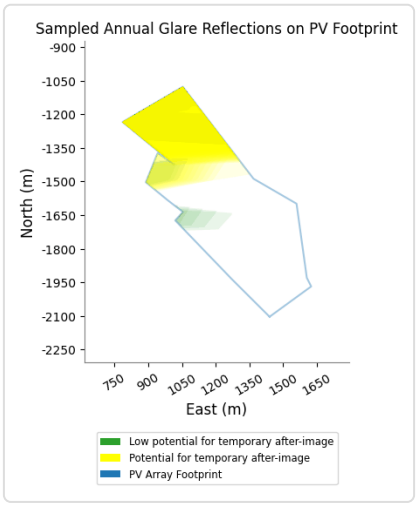
Green glare: 479 min.







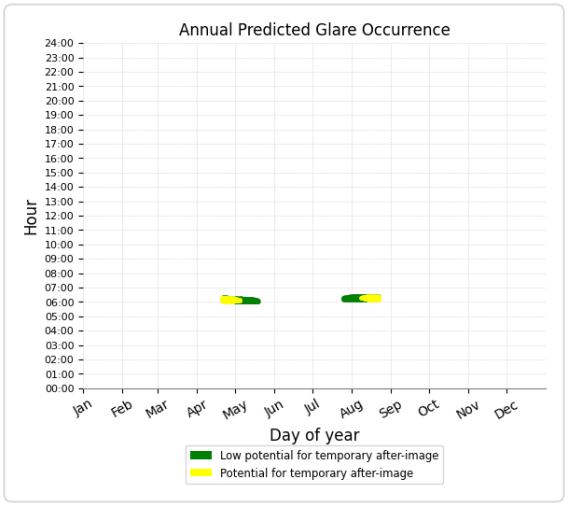


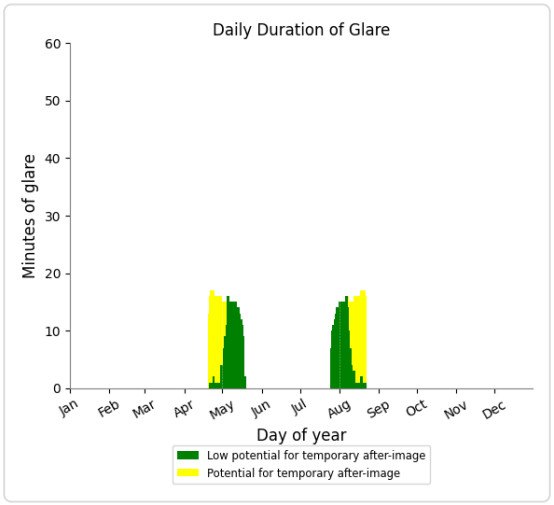


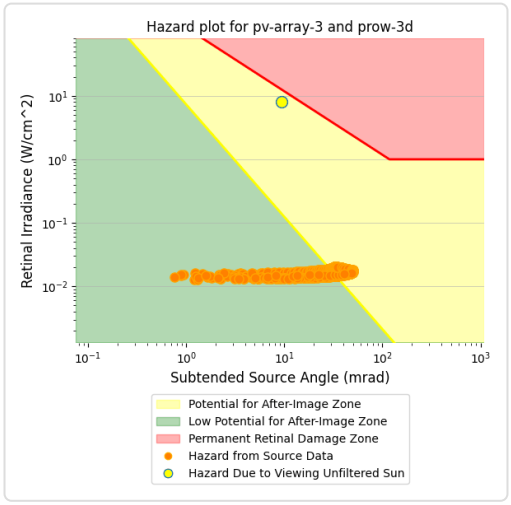
PV array 3 and Route: PRoW 3D

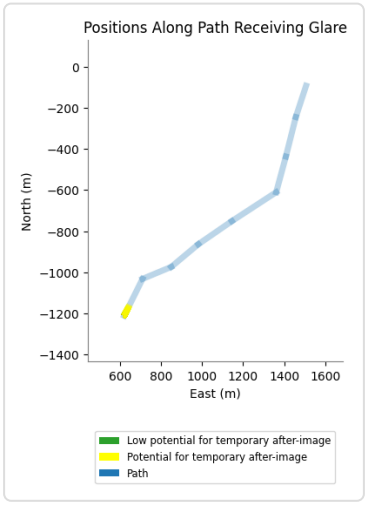
Yellow glare: 379 min.

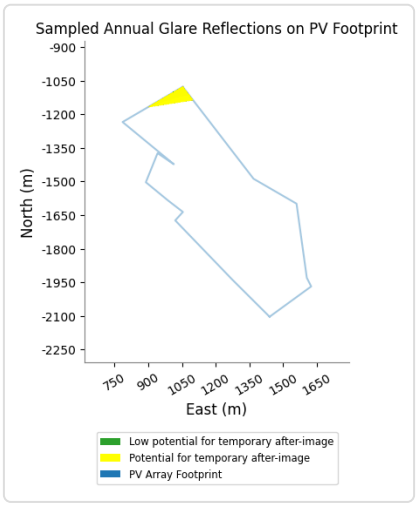
Green glare: 482 min.







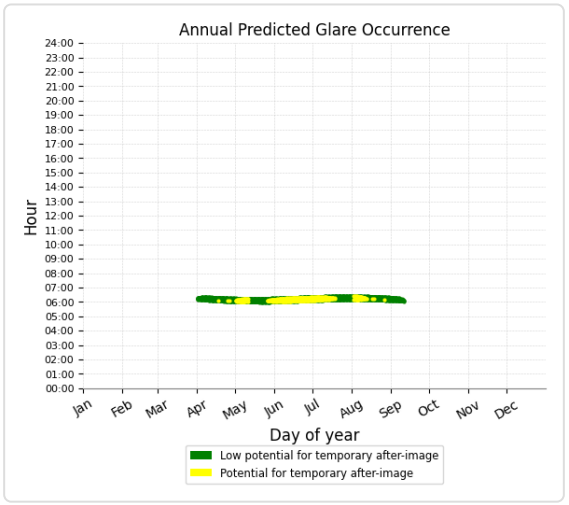


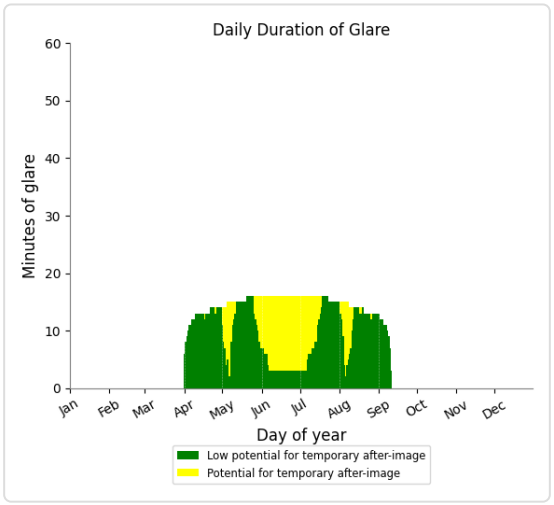


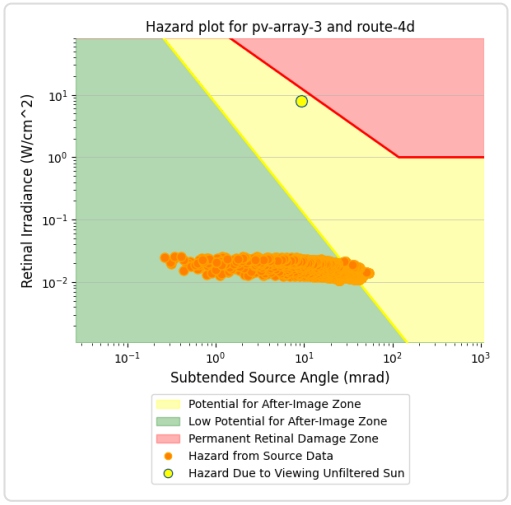
PV array 3 and Route: Route 4D

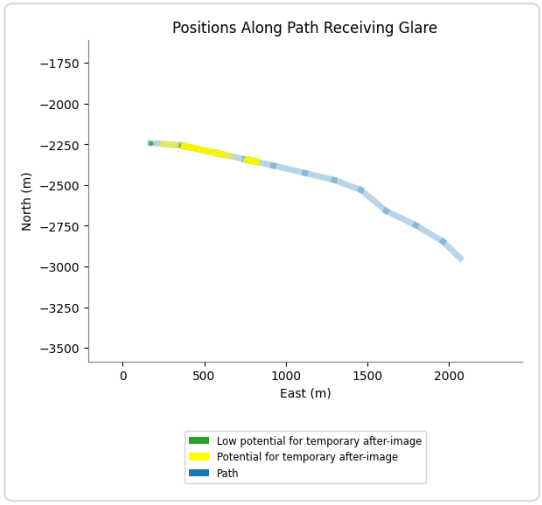
Yellow glare: 735 min.

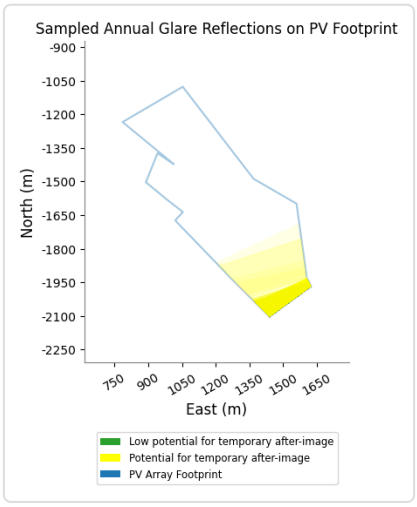
Green glare: 1,621 min.







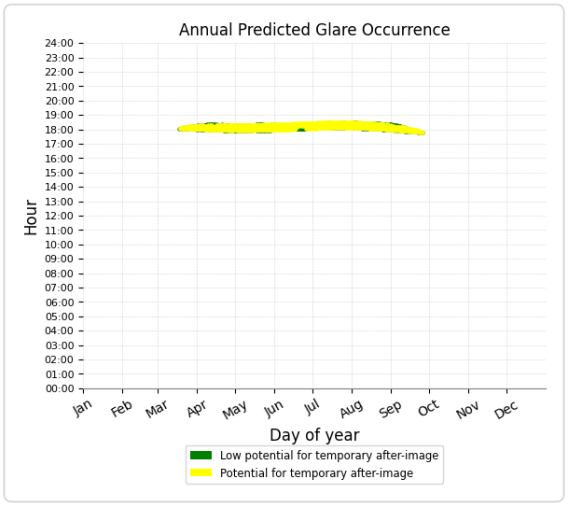


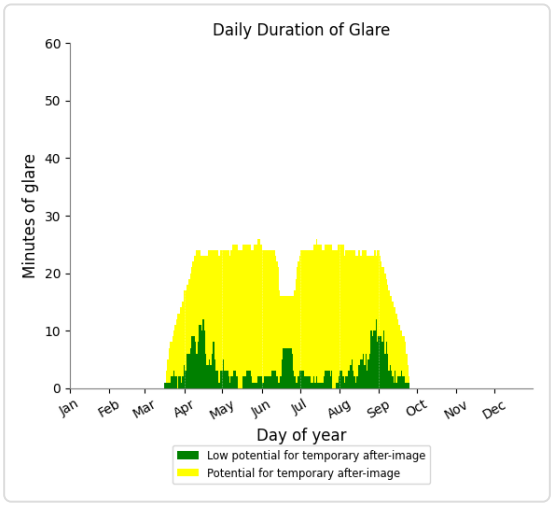


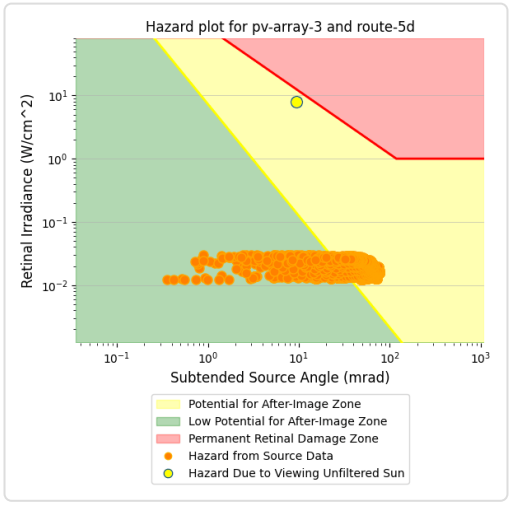
PV array 3 and Route: Route 5D

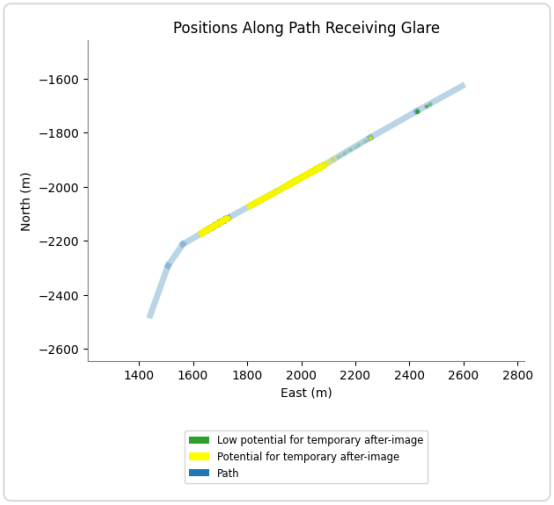
Yellow glare: 3,352 min.

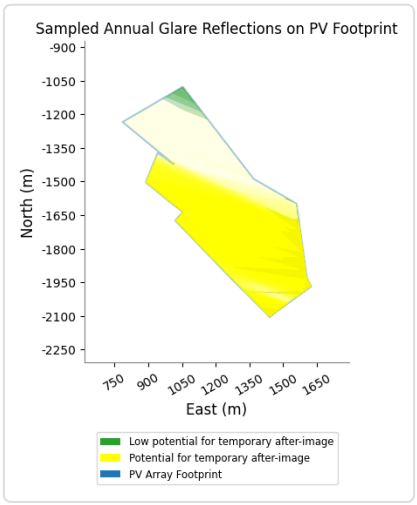
Green glare: 676 min.











PV array 3 and Route: PRoW 4D

No glare found

PV array 3 and Route: Route 1D

No glare found

PV array 3 and Route: Route 2D

No glare found

PV array 3 and Route: Route 3D

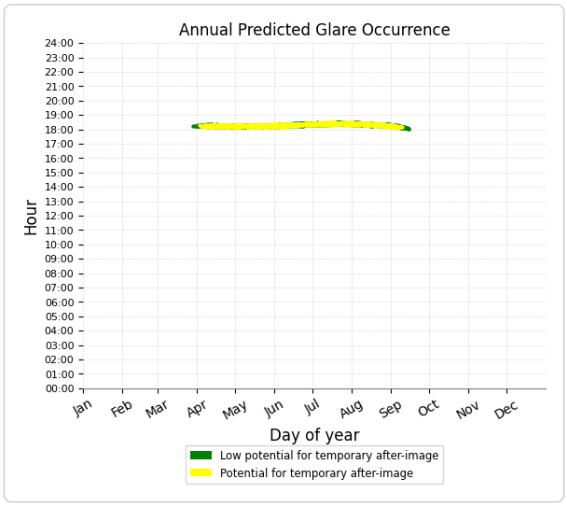
No glare found

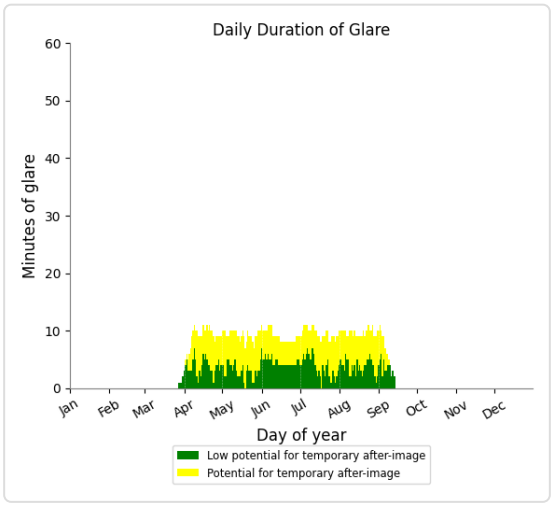
PV array 3 and Route: Route 6D

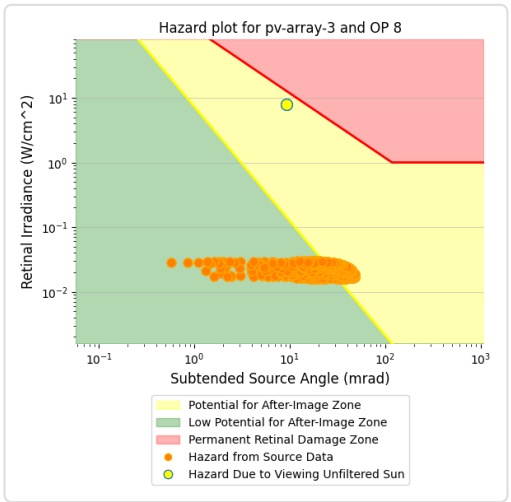
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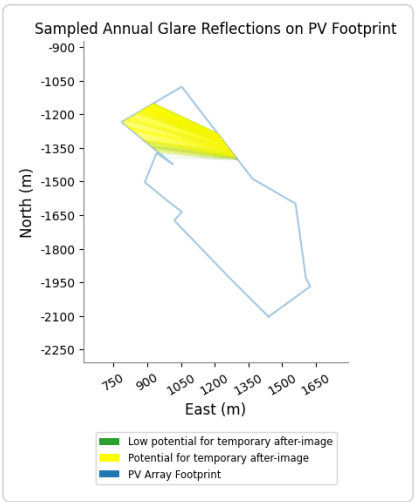
PV array 3 and OP 8

Yellow glare: 879 min.
Green glare: 626 min.





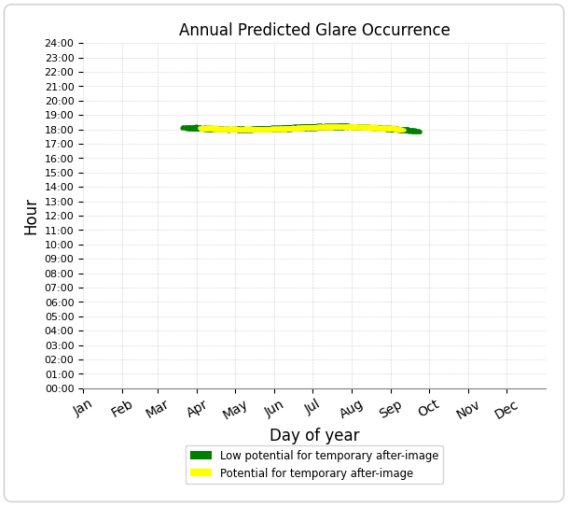


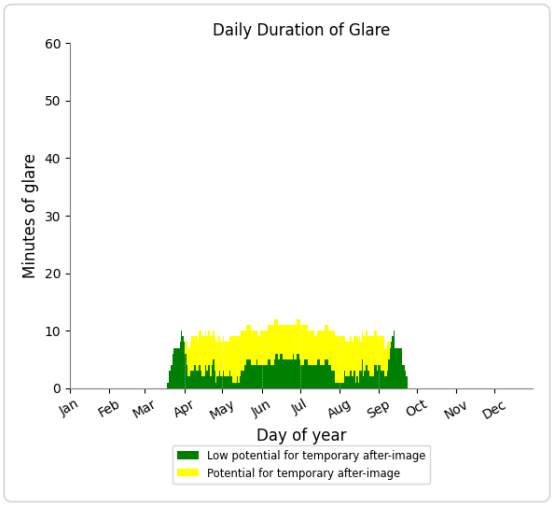


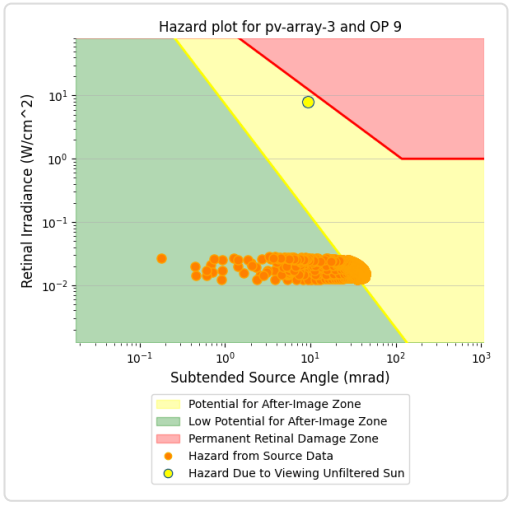
PV array 3 and OP 9

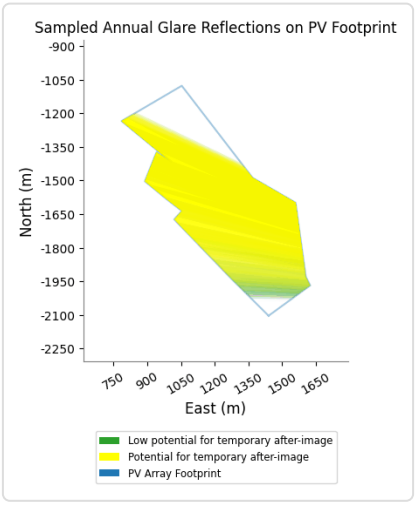
Yellow glare: 990 min.

Green glare: 732 min.





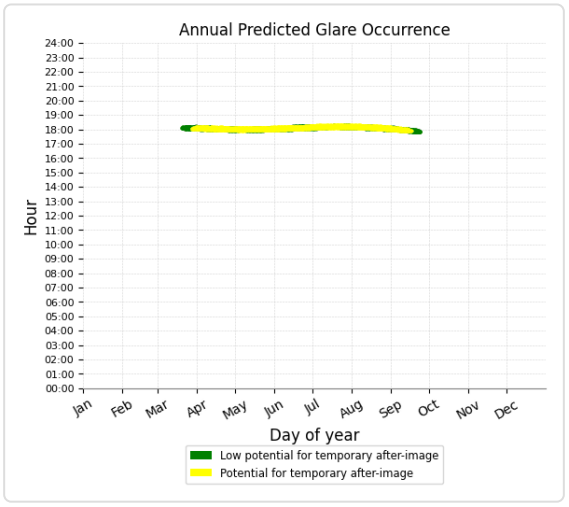


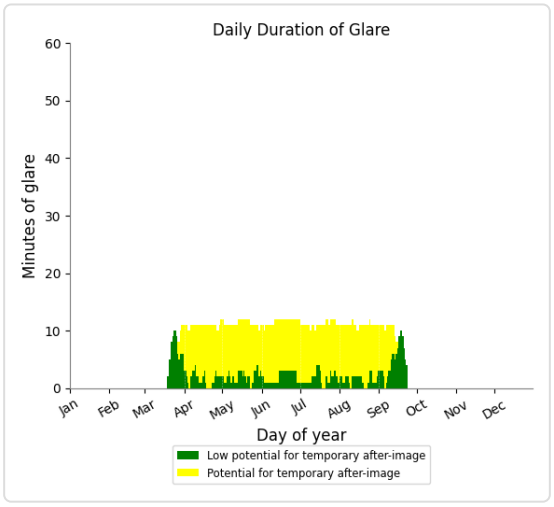


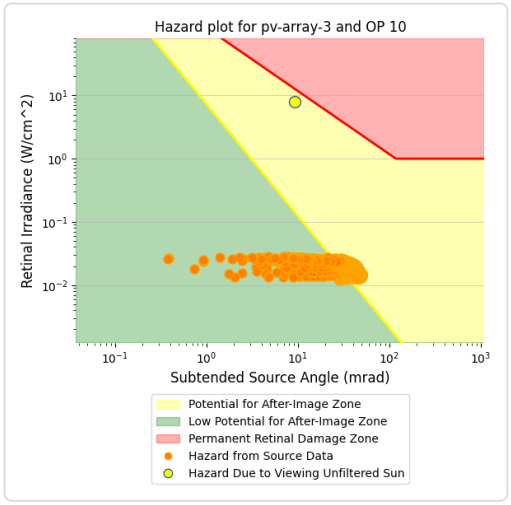
PV array 3 and OP 10

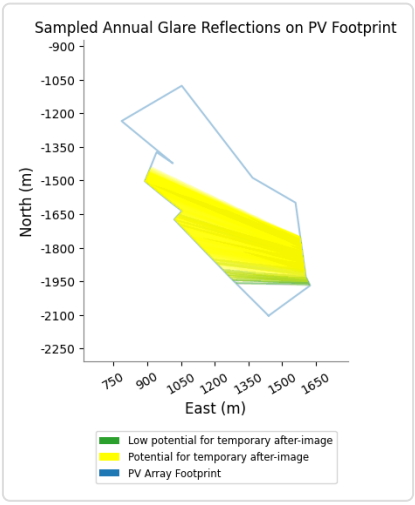
Yellow glare: 1,573 min.

Green glare: 469 min.





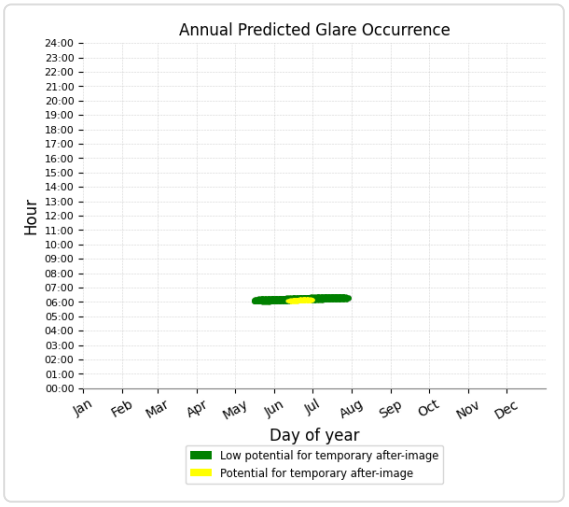


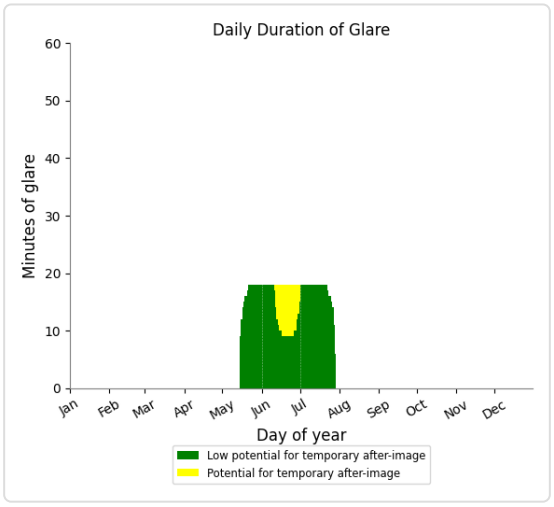


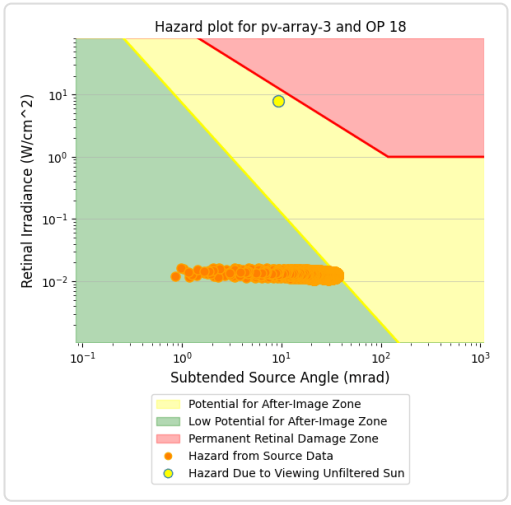
PV array 3 and OP 18

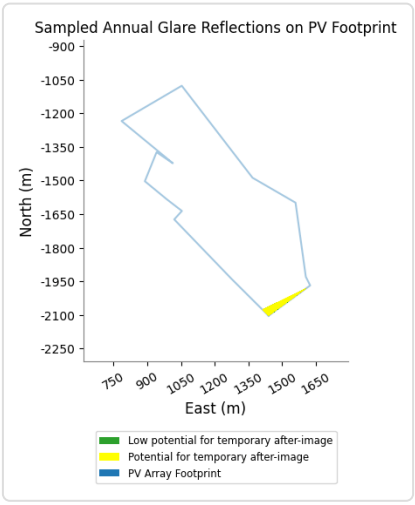
Yellow glare: 154 min.

Green glare: 1,156 min.





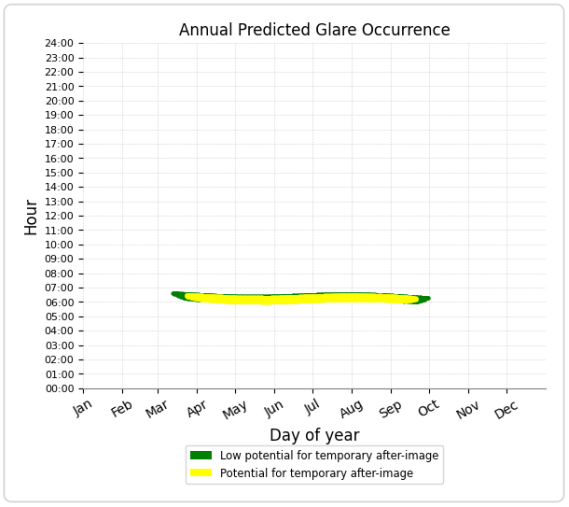


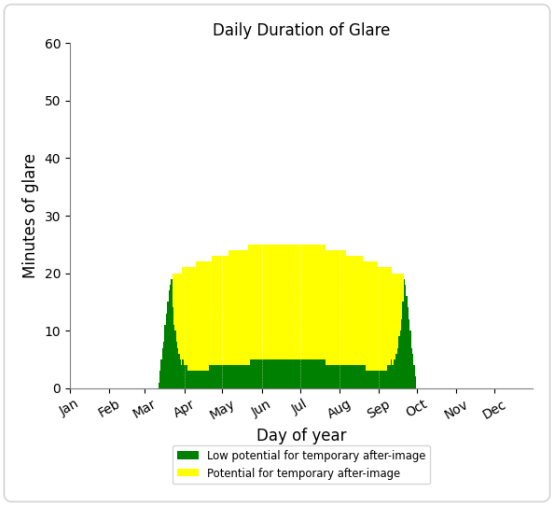


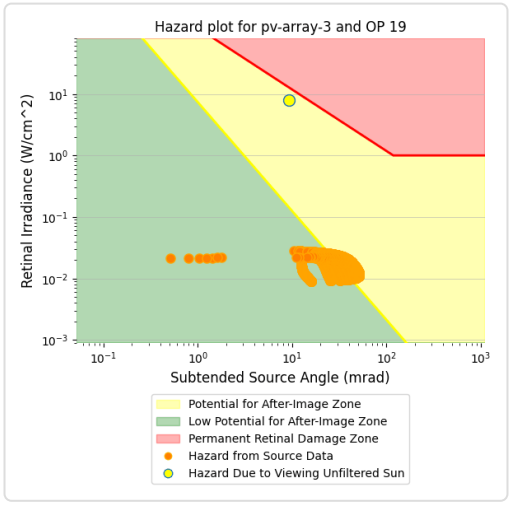
PV array 3 and OP 19

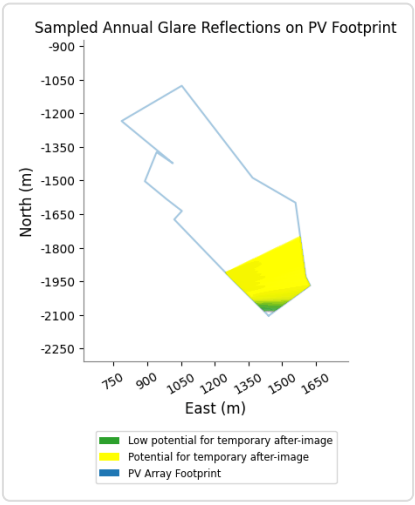
Yellow glare: 3,395 min.

Green glare: 1,051 min.





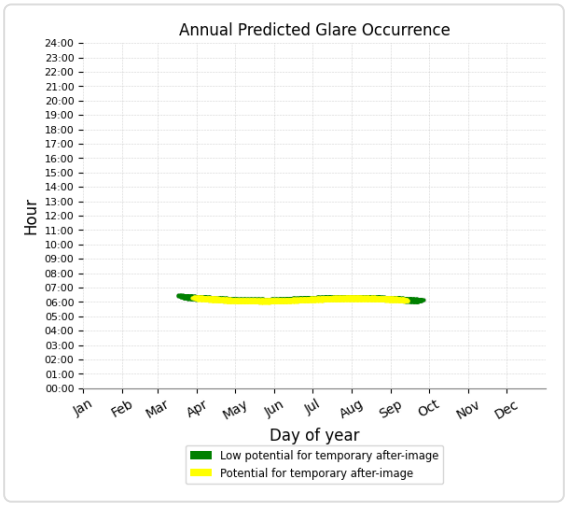


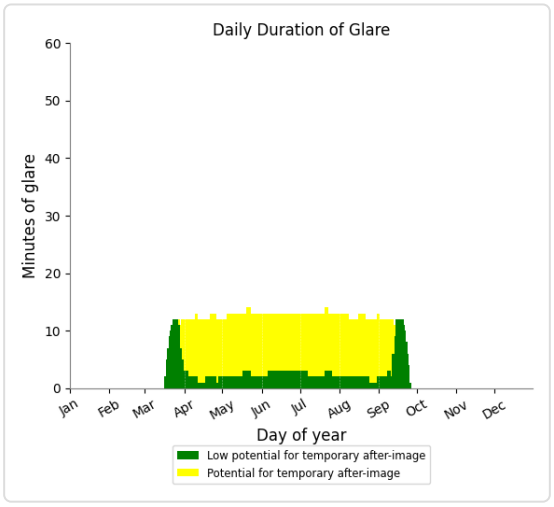


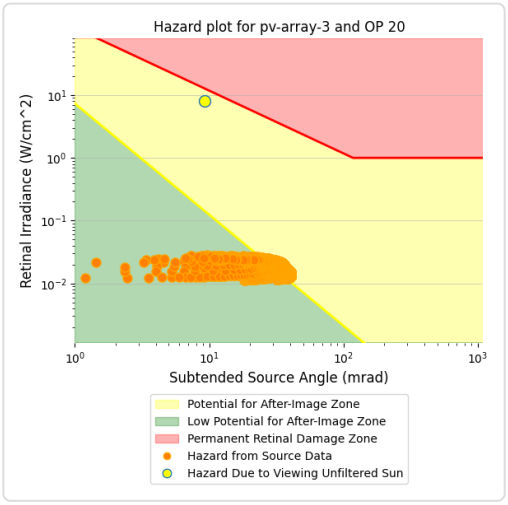
PV array 3 and OP 20

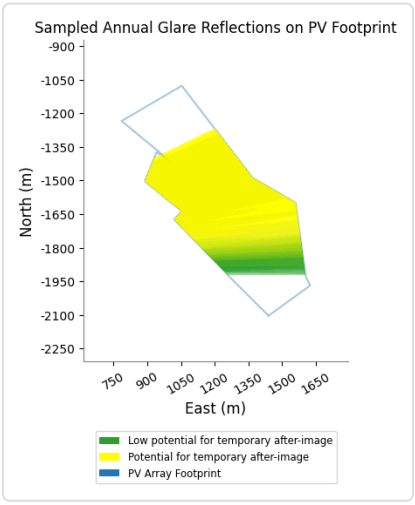
Yellow glare: 1,749 min.

Green glare: 634 min.





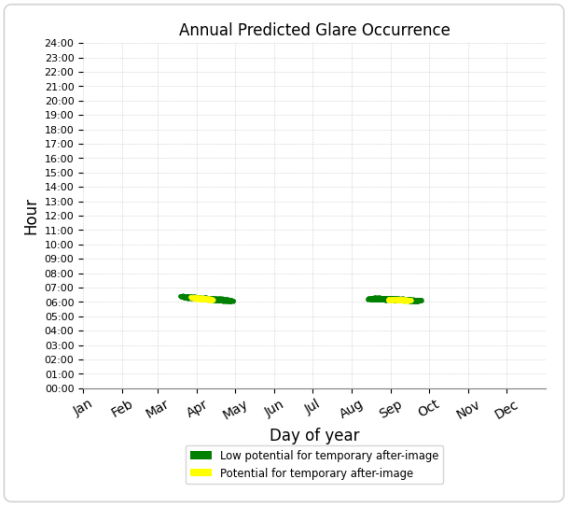


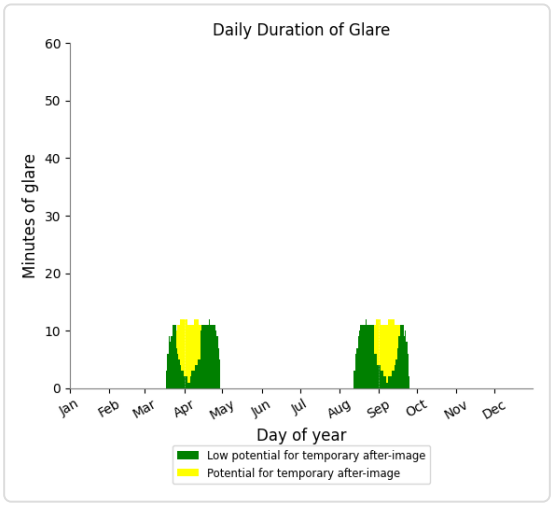


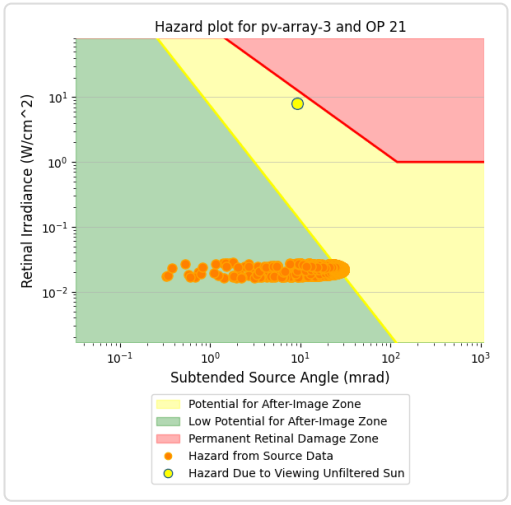
PV array 3 and OP 21

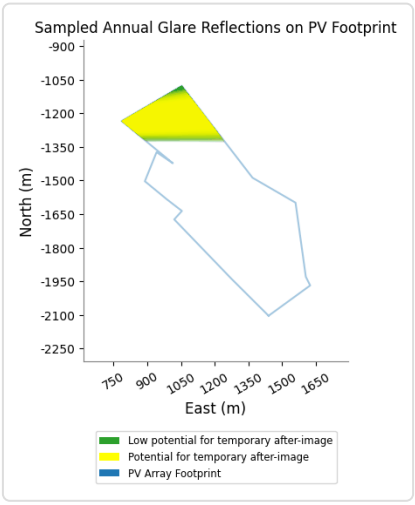
Yellow glare: 310 min.

Green glare: 594 min.





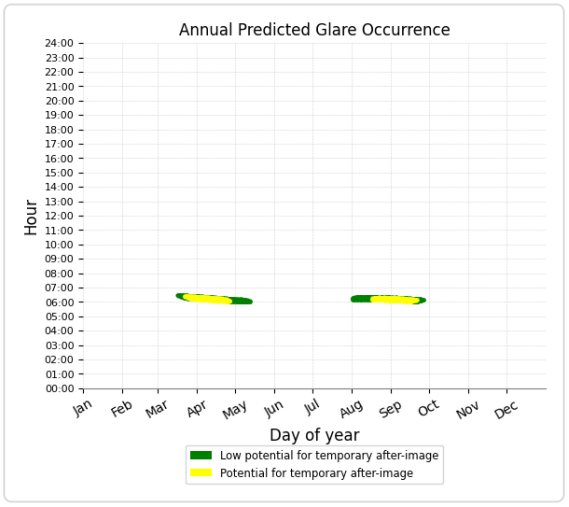


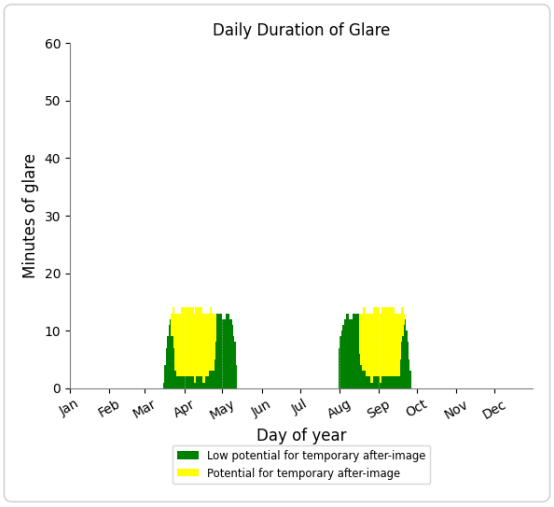


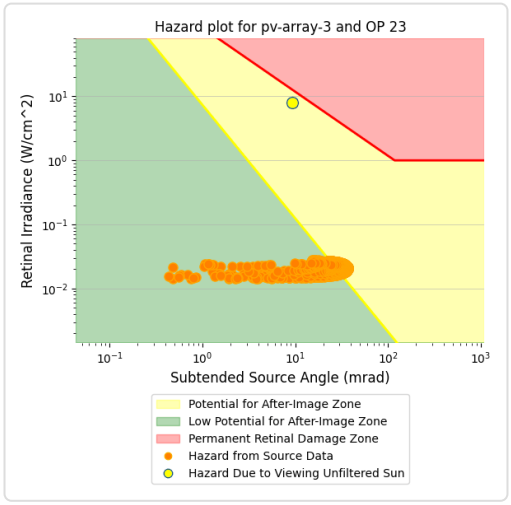
PV array 3 and OP 23

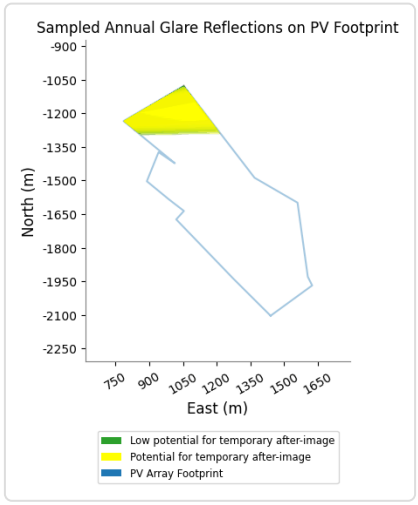
Yellow glare: 771 min.

Green glare: 656 min.





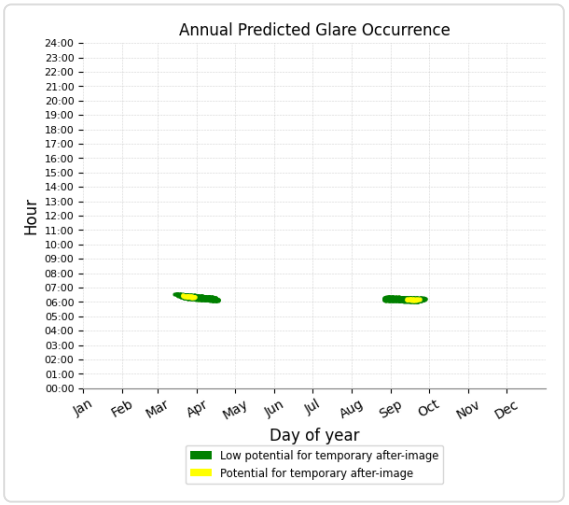


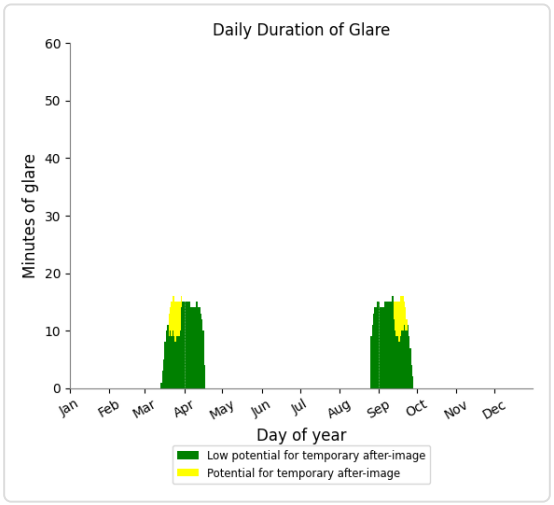


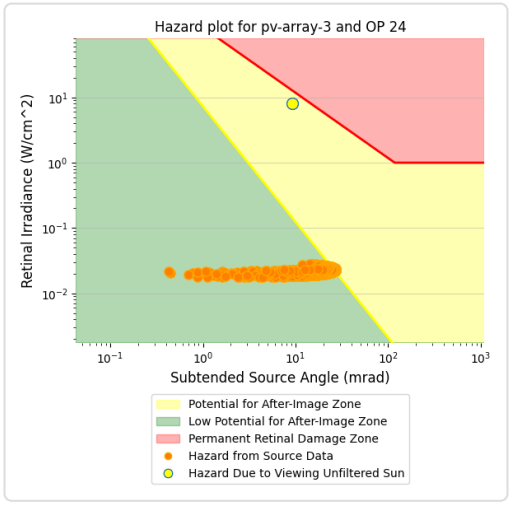
PV array 3 and OP 24

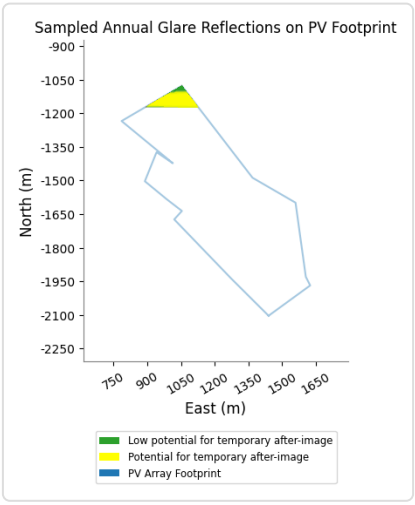
Yellow glare: 115 min.

Green glare: 780 min.





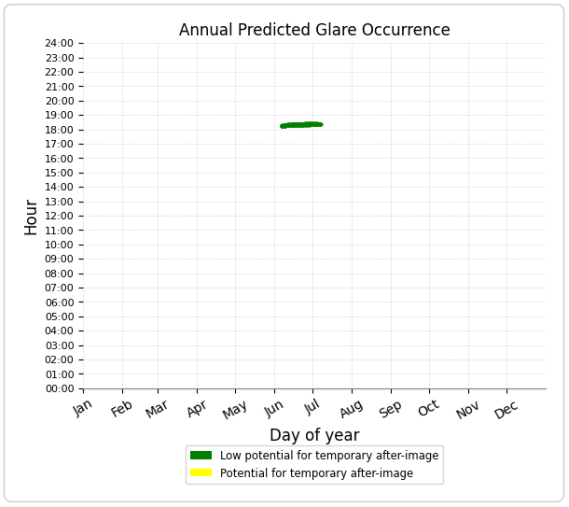


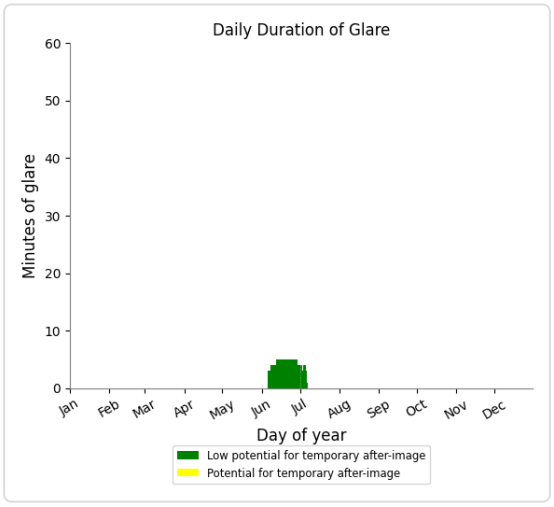


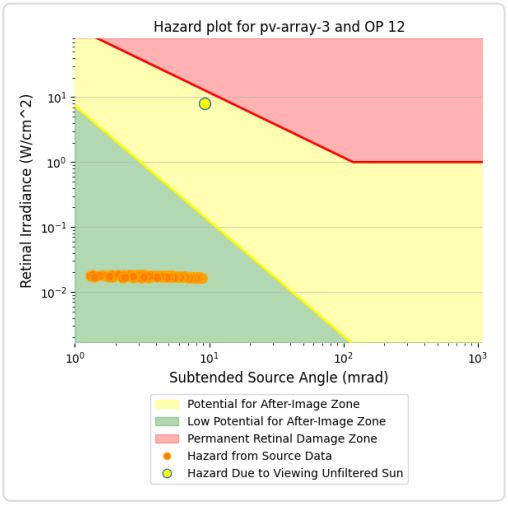
PV array 3 and OP 12

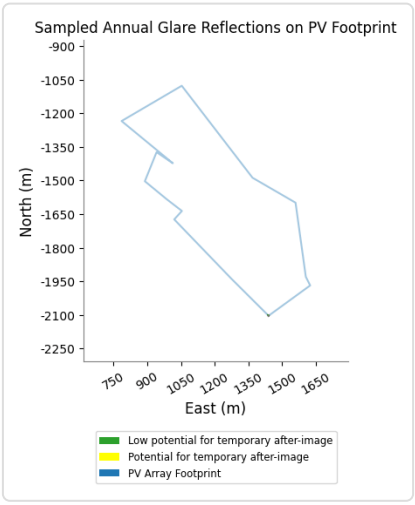
Yellow glare: none

Green glare: 138 min.





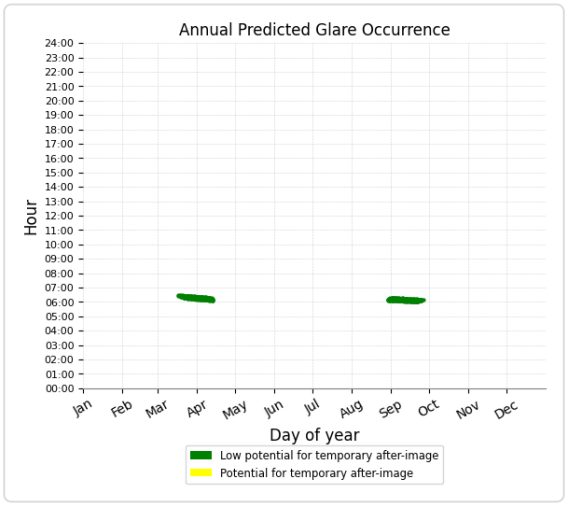


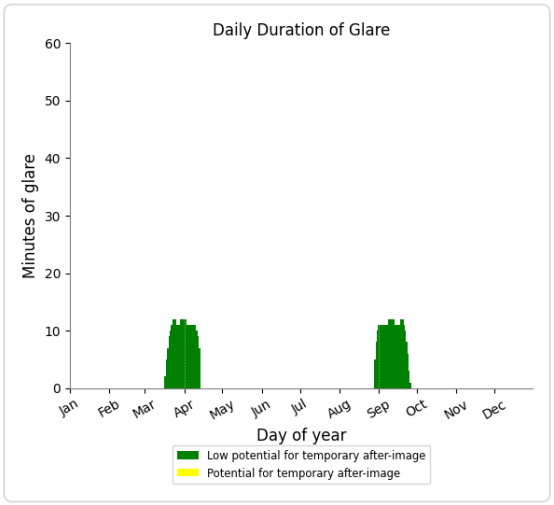


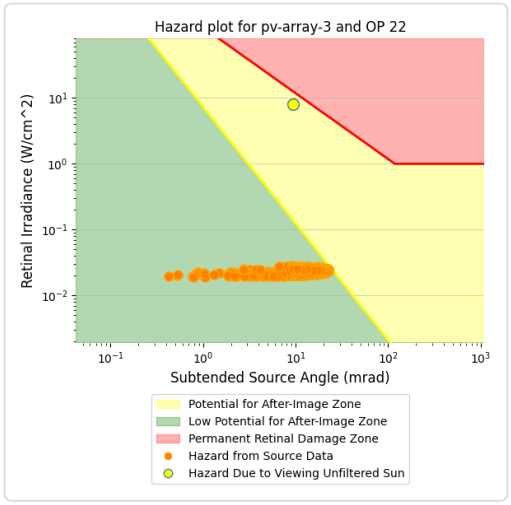
PV array 3 and OP 22

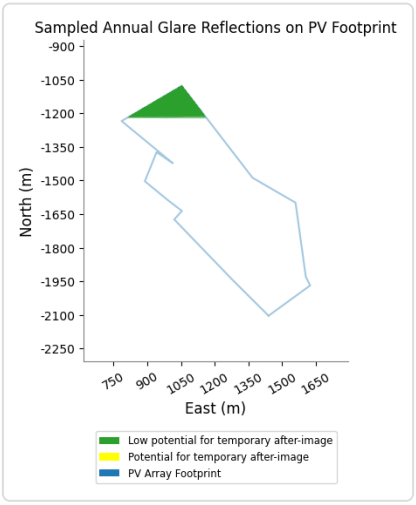
Yellow glare: none

Green glare: 577 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 7

No glare found

PV array 3 and OP 11

No glare found

PV array 3 and OP 13

No glare found

PV array 3 and OP 14

No glare found

PV array 3 and OP 15

No glare found

PV array 3 and OP 16

No glare found

PV array 3 and OP 17

No glare found

PV array 3 and OP 25

No glare found

PV array 3 and OP 26

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 29

No glare found

PV array 3 and OP 30

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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W2E

W2 Area	OP No. in Glare Analysis	Residential Receptor No.
A	1	1
A	2	2
A	3	3
A	4	4
A	5	5
A	6	6
A	7	7
A	8	8
A	9	9
A	10	10
A	11	11
A	12	12
A	13	13
A	14	14
A	15	15
A	16	16
A	17	17
B	1	18
B	2	19
B	3	20
B	4	21
B	5	22
B	6	23
B	7	24
B	8	25
B	9	26
B	10	27
B	11	28
B	12	29
B	13	30
B	14	31
B	15	32
B	16	33
C	1	34
C	2	35

C	3	36
C	4	37
C	5	38
C	6	39
C	7	40
C	8	41
C	9	42
C	10	43
C	11	44
C	12	45
C	13	46
C	14	47
C	15	48
C	16	49
C	17	50
C	18	51
C	19	52
C	20	53
C	21	22
C	22	54
C	23	55
C	24	56
C	25	57
C	26	58
C	27	59
C	28	60
C	29	61
C	30	62
C	31	21
C	32	20
C	33	19
C	34	63
C	35	18
C	36	64
C	37	65
D	1	66
D	2	67
D	3	68
D	4	69
D	5	70
D	6	71

D	7	72
D	8	73
D	9	74
D	10	75
D	11	76
D	12	77
D	13	78
D	14	79
D	15	80
D	16	81
D	17	82
D	18	83
D	19	84
D	20	43
D	21	42
D	22	85
D	23	41
D	24	40
D	25	86
D	26	37
D	27	39
D	28	38
D	29	36
D	30	35
E	1	87
E	2	88
E	3	89
E	4	90
E	5	91
E	6	92
E	7	93
E	8	94
E	9	95
E	10	96
E	11	97
E	12	98
E	13	99
E	14	100
E	15	101
E	16	102
E	17	103

E	18	104
E	19	105
E	20	106
E	21	107
E	22	82
E	23	81
E	24	79
E	25	78
E	26	80
E	27	77
E	28	76
E	29	75

FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **W2E**

Created 19 Jun, 2025
Updated 03 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 152629.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 6	8.0	180.0	22,432	373.9	55,823	930.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

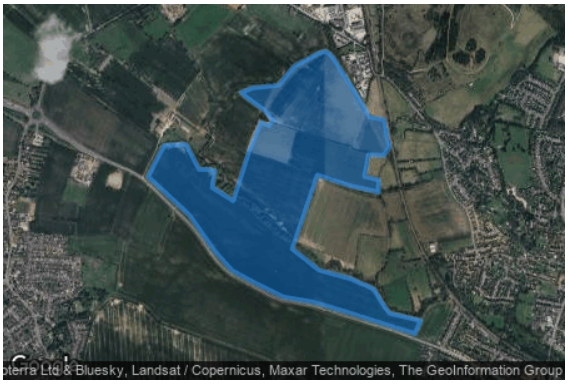
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1E	590	9.8	3,002	50.0
PRoW 2E	1,354	22.6	3,140	52.3
Route 1E	706	11.8	6,124	102.1
Route 2E	77	1.3	0	0.0
Route 3E	101	1.7	2,960	49.3
OP 1	780	13.0	924	15.4
OP 2	675	11.2	3,151	52.5
OP 3	876	14.6	1,683	28.1
OP 4	637	10.6	3,016	50.3
OP 5	927	15.4	3,527	58.8
OP 6	727	12.1	3,005	50.1
OP 7	619	10.3	2,133	35.5
OP 8	1,126	18.8	666	11.1
OP 9	917	15.3	1,061	17.7
OP 10	1,027	17.1	969	16.1
OP 11	539	9.0	1,477	24.6

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 12	291	4.8	989	16.5
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	1,347	22.4	1,745	29.1
OP 18	977	16.3	2,399	40.0
OP 19	801	13.3	2,864	47.7
OP 20	922	15.4	3,326	55.4
OP 21	1,020	17.0	3,290	54.8
OP 22	1,920	32.0	2,430	40.5
OP 23	1,098	18.3	899	15.0
OP 24	1,043	17.4	690	11.5
OP 25	588	9.8	353	5.9
OP 26	747	12.4	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

Component Data

PV Arrays

Name: WS2 - 6
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.351743	-1.229837	97.61	3.80	101.41
2	53.352505	-1.233861	94.53	3.80	98.33
3	53.353043	-1.236865	95.31	3.80	99.11
4	53.353248	-1.238882	95.00	3.80	98.80
5	53.353863	-1.240985	94.35	3.80	98.15
6	53.354324	-1.242401	94.20	3.80	98.00
7	53.355143	-1.243645	96.86	3.80	100.66
8	53.356578	-1.245319	96.64	3.80	100.44
9	53.358166	-1.248194	95.69	3.80	99.49
10	53.359446	-1.247079	93.04	3.80	96.84
11	53.359504	-1.245888	91.48	3.80	95.28
12	53.359472	-1.245534	91.40	3.80	95.20
13	53.358473	-1.244675	94.63	3.80	98.43
14	53.358473	-1.243946	93.46	3.80	97.26
15	53.358403	-1.243570	92.41	3.80	96.21
16	53.357730	-1.243763	95.81	3.80	99.61
17	53.357196	-1.242331	93.71	0.00	93.71
18	53.359209	-1.241242	96.14	3.80	99.94
19	53.360387	-1.240423	95.77	0.00	95.77
20	53.360265	-1.239884	96.51	0.00	96.51
21	53.360482	-1.239641	96.92	0.00	96.92
22	53.360877	-1.240185	95.55	3.80	99.35
23	53.361361	-1.241312	93.15	3.80	96.95
24	53.361607	-1.241789	92.53	3.80	96.33
25	53.361802	-1.240990	92.29	3.80	96.09
26	53.361905	-1.239225	94.46	3.80	98.26
27	53.362673	-1.238152	93.99	3.80	97.79
28	53.363211	-1.236521	95.54	3.80	99.34
29	53.363294	-1.235974	96.07	3.80	99.87
30	53.363185	-1.235685	96.63	3.80	100.43
31	53.363012	-1.235427	97.26	3.80	101.06
32	53.361110	-1.233421	100.05	3.80	103.85
33	53.360614	-1.232960	98.66	0.00	98.66
34	53.360502	-1.231962	97.03	0.00	97.03
35	53.359382	-1.231597	96.35	3.80	100.15
36	53.359036	-1.231978	96.15	3.80	99.95
37	53.359058	-1.233029	96.76	3.80	100.56
38	53.358178	-1.233292	96.16	3.80	99.96
39	53.358043	-1.232332	96.00	0.00	96.00
40	53.357538	-1.232337	96.00	3.80	99.80
41	53.357790	-1.234306	97.51	0.00	97.51
42	53.358236	-1.236543	100.48	3.80	104.28
43	53.355220	-1.238260	93.35	3.80	97.15
44	53.354349	-1.236406	93.10	0.00	93.10
45	53.353990	-1.234188	93.42	3.80	97.22
46	53.353808	-1.233539	92.47	3.80	96.27
47	53.353753	-1.233249	92.05	3.80	95.85
48	53.353564	-1.232632	92.25	3.80	96.05
49	53.353078	-1.232160	92.44	3.80	96.24
50	53.352591	-1.231581	93.45	3.80	97.25
51	53.352362	-1.229945	94.76	3.80	98.56
52	53.352322	-1.229647	95.16	3.80	98.96
53	53.352272	-1.229435	95.38	3.80	99.18
54	53.352056	-1.229602	96.29	3.80	100.09

Route Receptors

Name: PRoW 1E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.353338	-1.250292	109.02	2.75	111.77
2	53.352928	-1.248318	109.14	2.75	111.89
3	53.352108	-1.247202	110.97	2.75	113.72
4	53.350469	-1.239134	109.42	2.75	112.17
5	53.348522	-1.232783	117.41	2.75	120.16
6	53.348215	-1.230380	116.92	2.75	119.67

Name: PRoW 2E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.350898	-1.240432	106.18	2.75	108.93
2	53.353101	-1.238758	95.46	2.75	98.21

Name: Route 1E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361604	-1.261152	111.91	1.50	113.41
2	53.361182	-1.258427	107.16	1.50	108.66
3	53.360529	-1.255530	101.69	1.50	103.19
4	53.359440	-1.253127	100.33	1.50	101.83
5	53.358634	-1.250380	97.15	1.50	98.65
6	53.358109	-1.248513	95.90	1.50	97.40
7	53.356853	-1.246432	96.26	1.50	97.76
8	53.355560	-1.244415	96.64	1.50	98.14
9	53.354228	-1.242612	95.16	1.50	96.66
10	53.353344	-1.240016	95.11	1.50	96.61
11	53.352819	-1.237055	96.04	1.50	97.54
12	53.352384	-1.234137	95.28	1.50	96.78
13	53.351782	-1.231175	96.49	1.50	97.99
14	53.351180	-1.228300	99.14	1.50	100.64

Name: Route 2E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361068	-1.255661	103.45	1.50	104.95
2	53.362746	-1.254695	97.96	1.50	99.46
3	53.363309	-1.254363	95.56	1.50	97.06
4	53.364148	-1.251648	97.18	1.50	98.68
5	53.365057	-1.248998	95.03	1.50	96.53
6	53.365947	-1.246370	98.14	1.50	99.64
7	53.366830	-1.243795	99.54	1.50	101.04

Name: Route 3E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.364218	-1.232959	98.37	2.75	101.12
2	53.362413	-1.232412	99.30	2.75	102.05
3	53.360665	-1.231832	97.11	2.75	99.86
4	53.358885	-1.231210	96.92	2.75	99.67
5	53.357137	-1.230566	96.93	2.75	99.68
6	53.355485	-1.229601	94.67	2.75	97.42
7	53.353935	-1.228131	94.61	2.75	97.36
8	53.352597	-1.226232	94.64	2.75	97.39
9	53.351438	-1.223914	94.78	2.75	97.53

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.362764	-1.233919	98.85	2.00
OP 2	2	53.361855	-1.233265	100.01	2.00
OP 3	3	53.360899	-1.229595	100.65	2.00
OP 4	4	53.359958	-1.228265	104.67	2.00
OP 5	5	53.358549	-1.227579	109.03	2.00
OP 6	6	53.357146	-1.226441	110.23	2.00
OP 7	7	53.355968	-1.225672	104.08	2.00
OP 8	8	53.354881	-1.227260	97.13	2.00
OP 9	9	53.353340	-1.226123	94.43	2.00
OP 10	10	53.352334	-1.227159	95.08	2.00
OP 11	11	53.351396	-1.228210	98.18	2.00
OP 12	12	53.350835	-1.229028	101.94	2.00
OP 13	13	53.349148	-1.230235	118.33	2.00
OP 14	14	53.346631	-1.228615	119.19	2.00
OP 15	15	53.345757	-1.229146	120.57	2.00
OP 16	16	53.344991	-1.230213	120.21	2.00
OP 17	17	53.350155	-1.253304	119.31	2.00
OP 18	18	53.351881	-1.252339	112.24	2.00
OP 19	19	53.354058	-1.252915	109.26	2.00
OP 20	20	53.355259	-1.253838	112.85	2.00
OP 21	21	53.355586	-1.256209	116.11	2.00
OP 22	22	53.356789	-1.257491	119.65	2.00
OP 23	23	53.358922	-1.256526	108.43	2.00
OP 24	24	53.359005	-1.252706	99.04	2.00
OP 25	25	53.360420	-1.246237	93.88	2.00
OP 26	26	53.361483	-1.255925	104.77	2.00
OP 27	27	53.363387	-1.252577	95.68	2.00
OP 28	28	53.364642	-1.249358	96.02	2.00
OP 29	29	53.365564	-1.246659	97.16	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 6	8.0	180.0	22,432	373.9	55,823	930.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1E	590	9.8	3,002	50.0
PRoW 2E	1,354	22.6	3,140	52.3
Route 1E	706	11.8	6,124	102.1
Route 2E	77	1.3	0	0.0
Route 3E	101	1.7	2,960	49.3
OP 1	780	13.0	924	15.4
OP 2	675	11.2	3,151	52.5
OP 3	876	14.6	1,683	28.1
OP 4	637	10.6	3,016	50.3
OP 5	927	15.4	3,527	58.8
OP 6	727	12.1	3,005	50.1
OP 7	619	10.3	2,133	35.5
OP 8	1,126	18.8	666	11.1
OP 9	917	15.3	1,061	17.7
OP 10	1,027	17.1	969	16.1
OP 11	539	9.0	1,477	24.6
OP 12	291	4.8	989	16.5
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	1,347	22.4	1,745	29.1
OP 18	977	16.3	2,399	40.0
OP 19	801	13.3	2,864	47.7
OP 20	922	15.4	3,326	55.4
OP 21	1,020	17.0	3,290	54.8
OP 22	1,920	32.0	2,430	40.5
OP 23	1,098	18.3	899	15.0
OP 24	1,043	17.4	690	11.5
OP 25	588	9.8	353	5.9
OP 26	747	12.4	0	0.0
OP 27	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

PV: WS2 - 6 potential temporary after-image

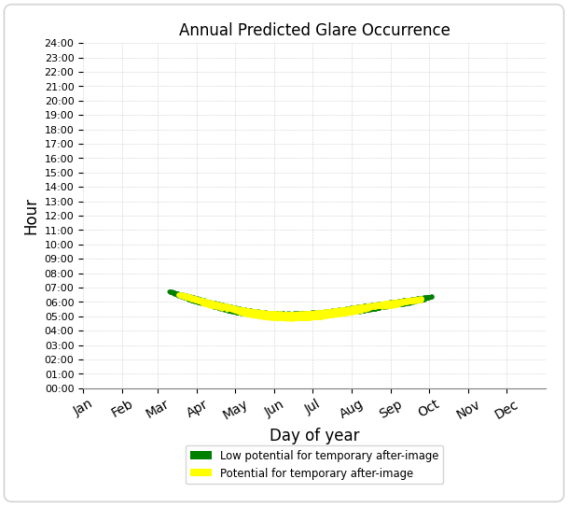
Receptor results ordered by category of glare

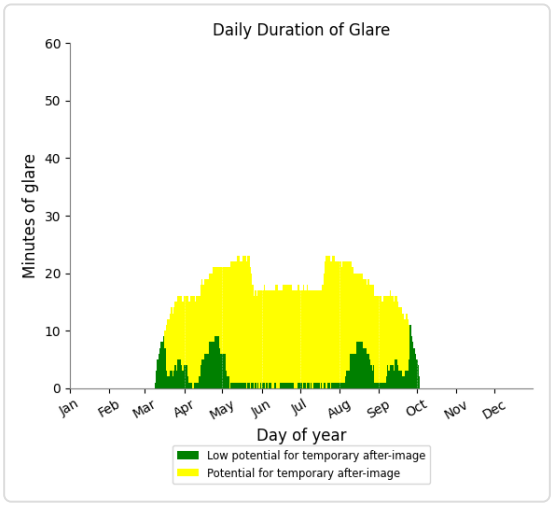
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1E	590	9.8	3,002	50.0
PRoW 2E	1,354	22.6	3,140	52.3
Route 1E	706	11.8	6,124	102.1
Route 3E	101	1.7	2,960	49.3
Route 2E	77	1.3	0	0.0
OP 1	780	13.0	924	15.4
OP 2	675	11.2	3,151	52.5
OP 3	876	14.6	1,683	28.1
OP 4	637	10.6	3,016	50.3
OP 5	927	15.4	3,527	58.8
OP 6	727	12.1	3,005	50.1
OP 7	619	10.3	2,133	35.5
OP 8	1,126	18.8	666	11.1
OP 9	917	15.3	1,061	17.7
OP 10	1,027	17.1	969	16.1
OP 11	539	9.0	1,477	24.6
OP 12	291	4.8	989	16.5
OP 17	1,347	22.4	1,745	29.1
OP 18	977	16.3	2,399	40.0
OP 19	801	13.3	2,864	47.7
OP 20	922	15.4	3,326	55.4
OP 21	1,020	17.0	3,290	54.8
OP 22	1,920	32.0	2,430	40.5
OP 23	1,098	18.3	899	15.0
OP 24	1,043	17.4	690	11.5
OP 25	588	9.8	353	5.9
OP 26	747	12.4	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

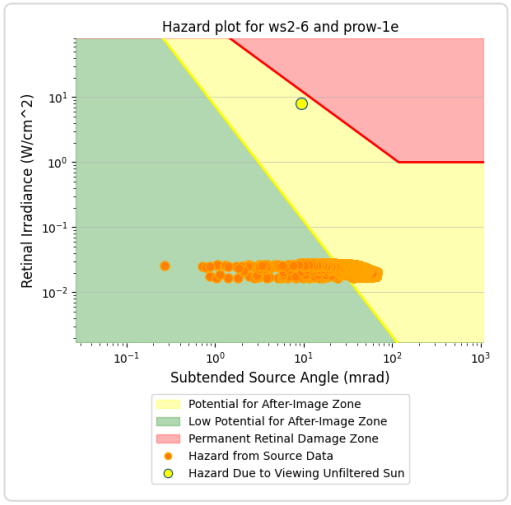
WS2 - 6 and Route: PRoW 1E

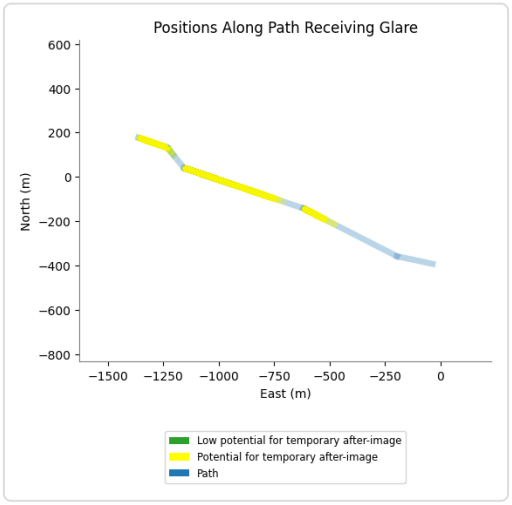
Yellow glare: 3,002 min.

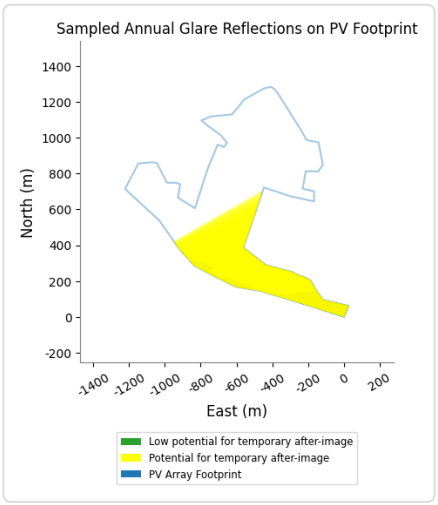
Green glare: 590 min.







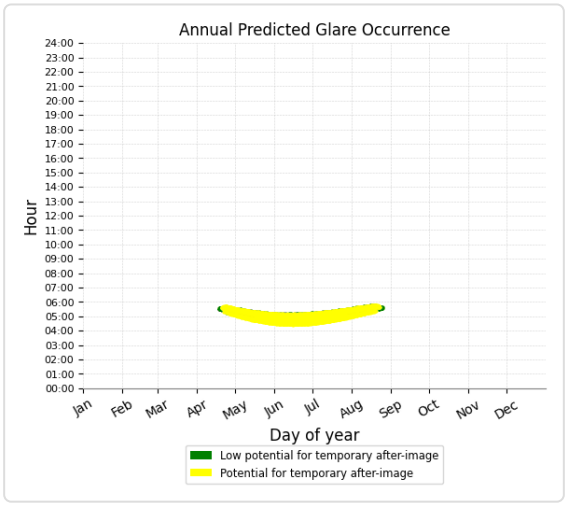


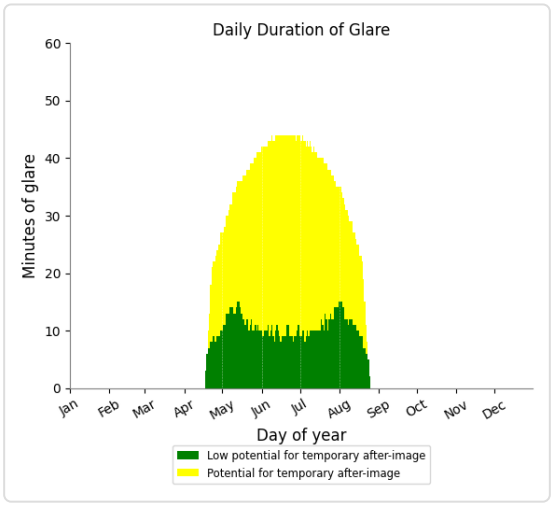


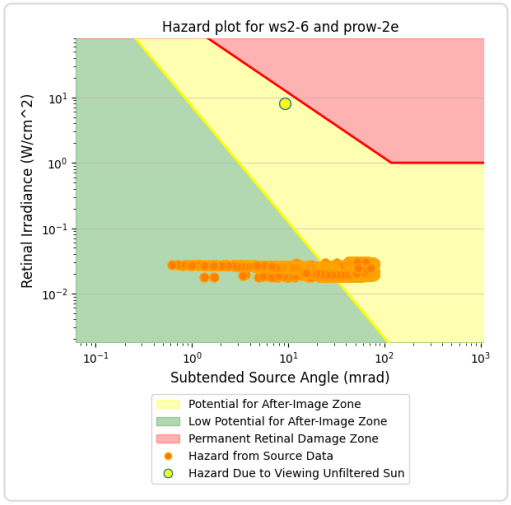
WS2 - 6 and Route: PRoW 2E

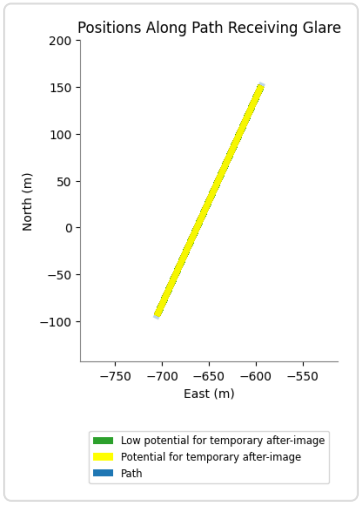
Yellow glare: 3,140 min.

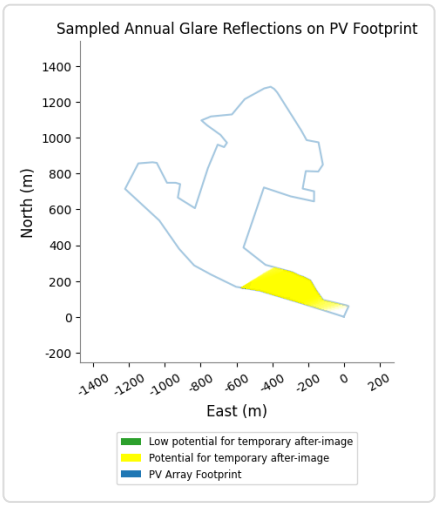
Green glare: 1,354 min.







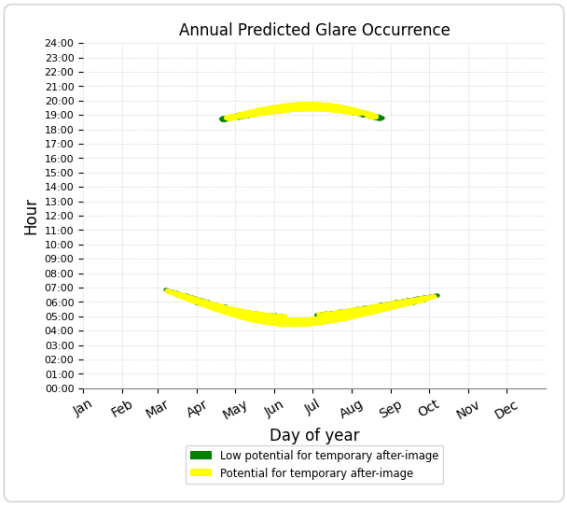


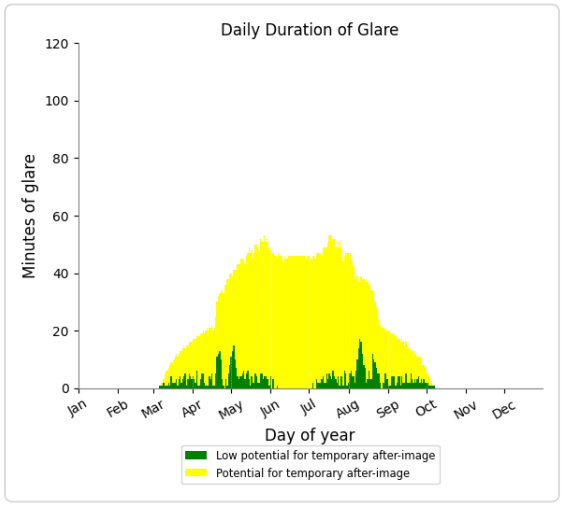


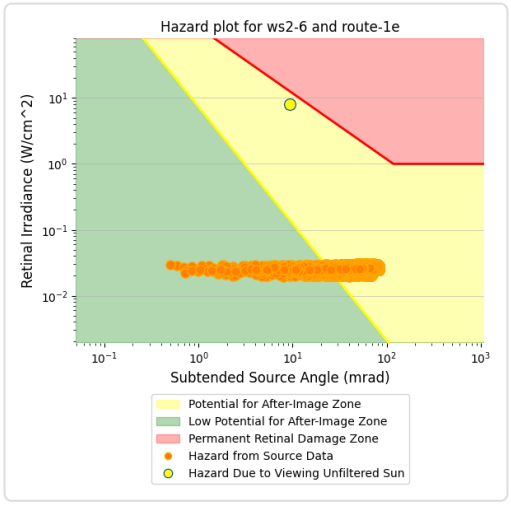
WS2 - 6 and Route: Route 1E

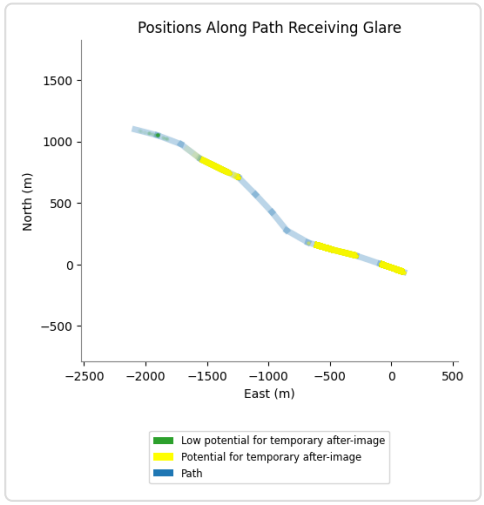
Yellow glare: 6,124 min.

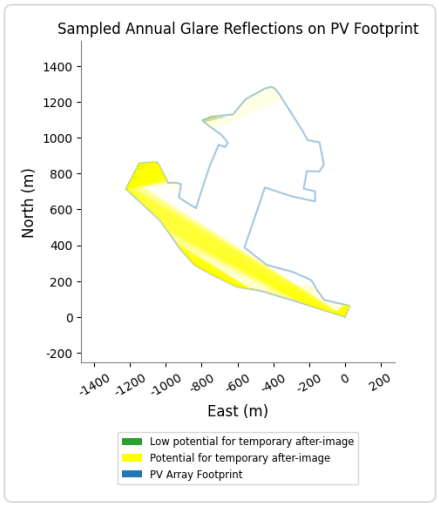
Green glare: 706 min.







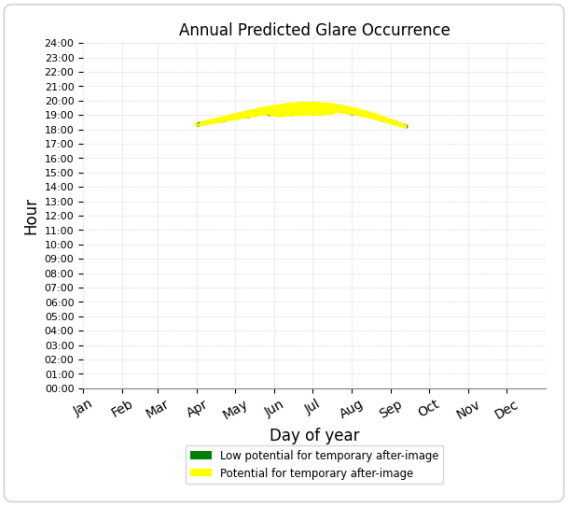


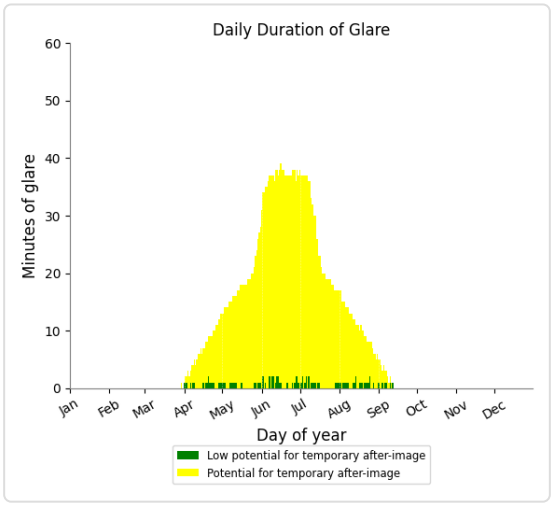


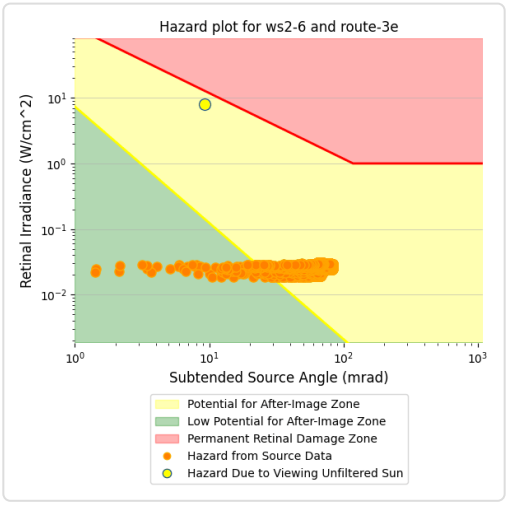
WS2 - 6 and Route: Route 3E

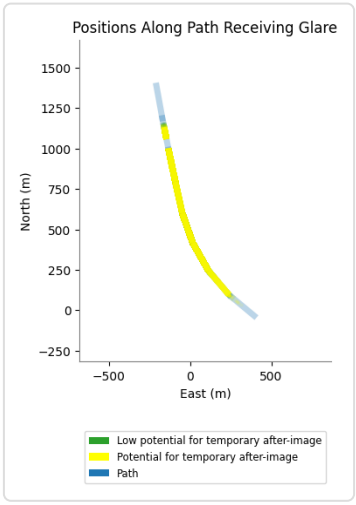
Yellow glare: 2,960 min.

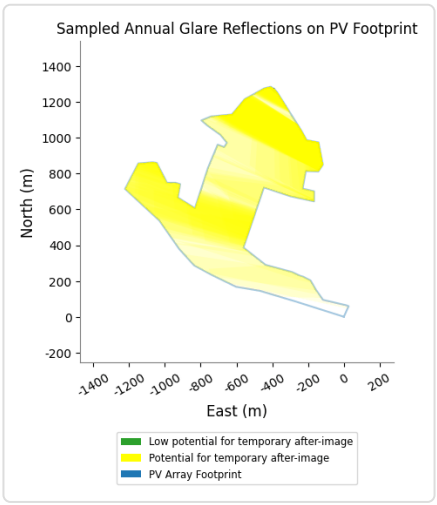
Green glare: 101 min.







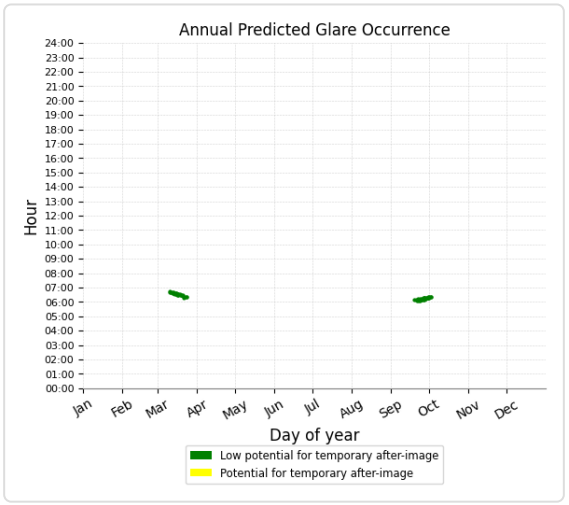


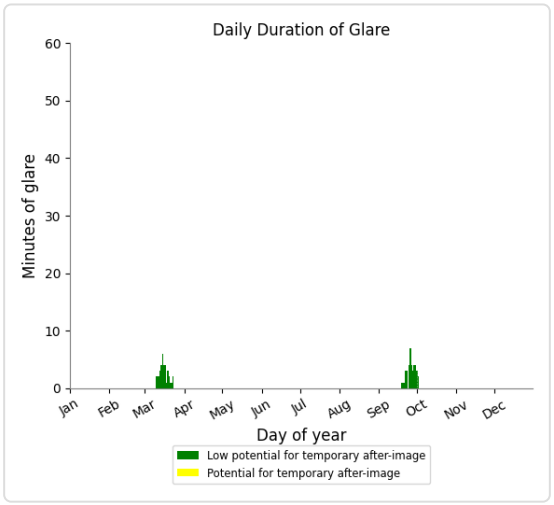


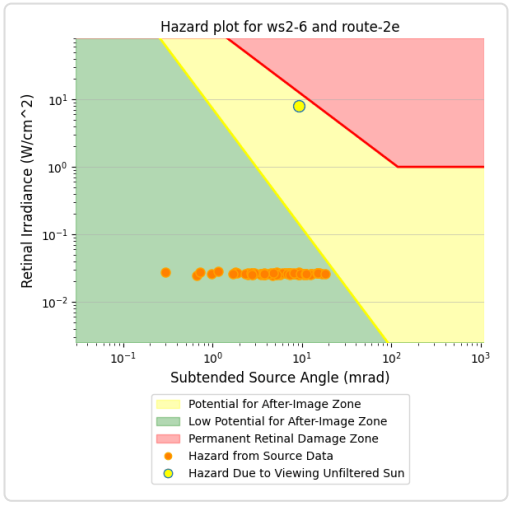
WS2 - 6 and Route: Route 2E

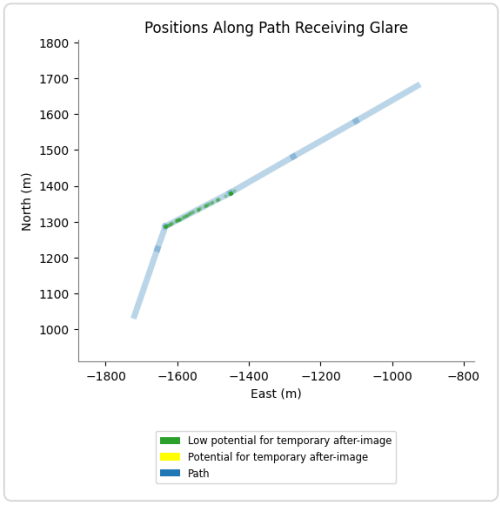
Yellow glare: none

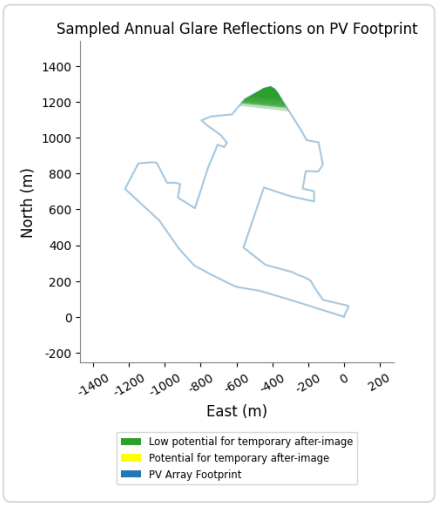
Green glare: 77 min.







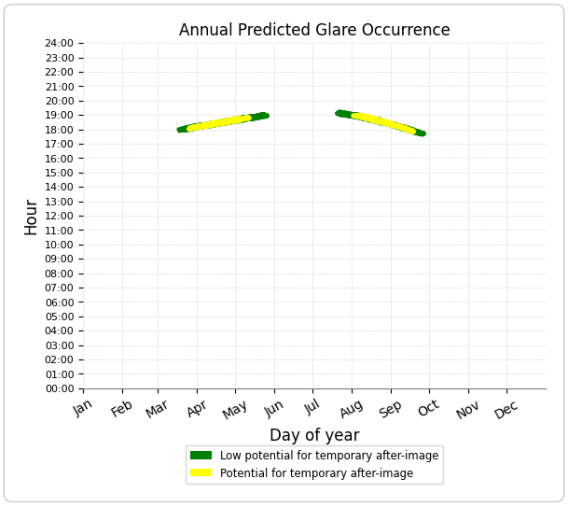


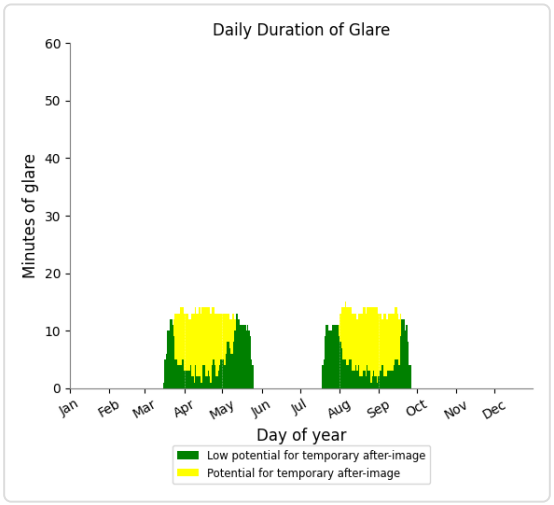


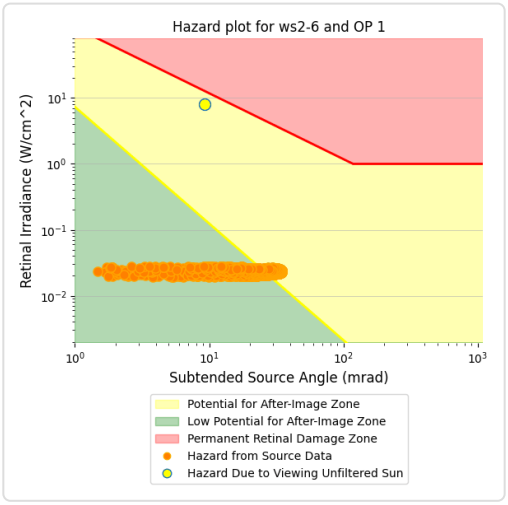
WS2 - 6 and OP 1

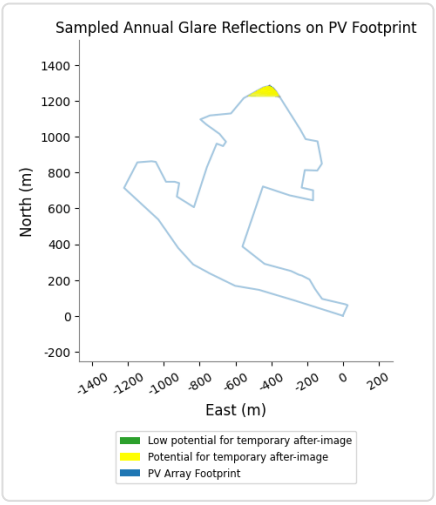
Yellow glare: 924 min.

Green glare: 780 min.





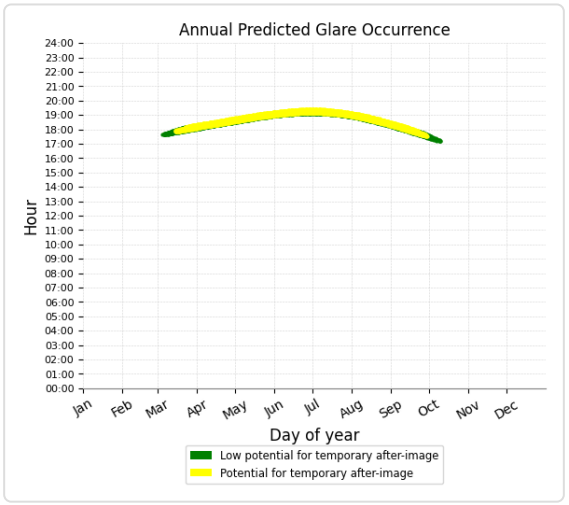


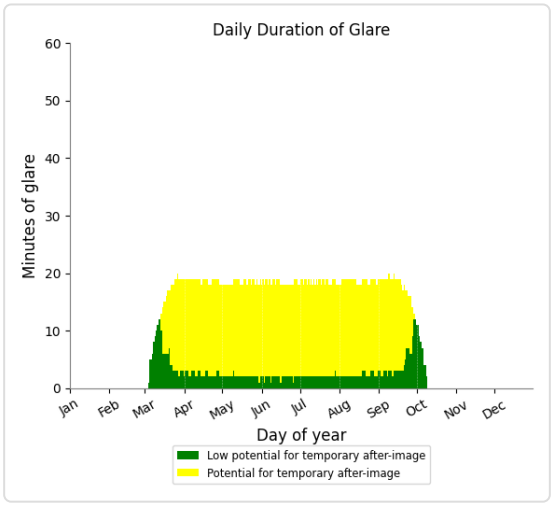


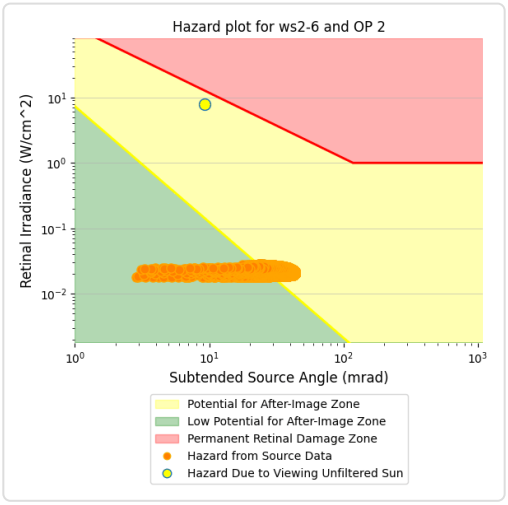
WS2 - 6 and OP 2

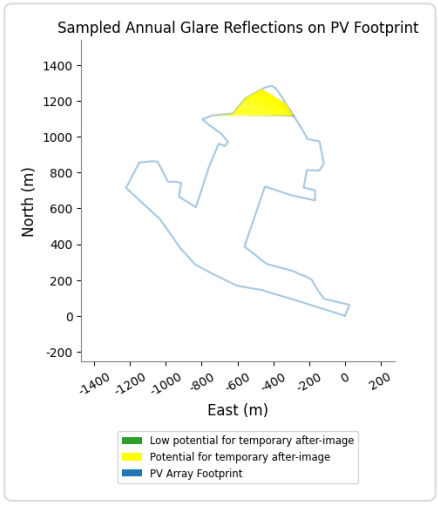
Yellow glare: 3,151 min.

Green glare: 675 min.





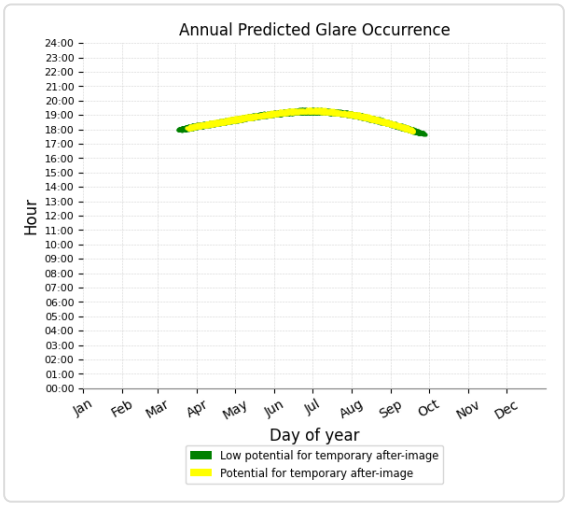


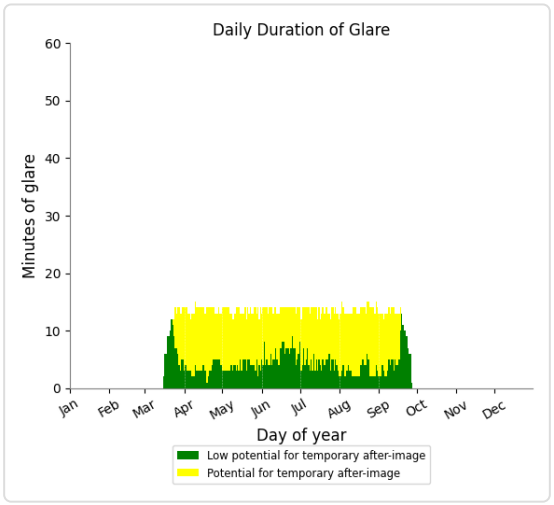


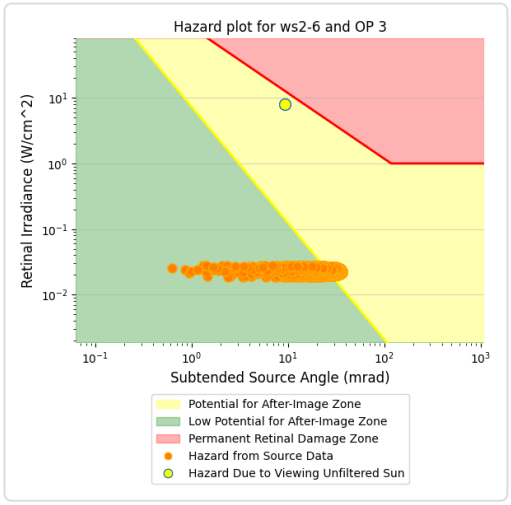
WS2 - 6 and OP 3

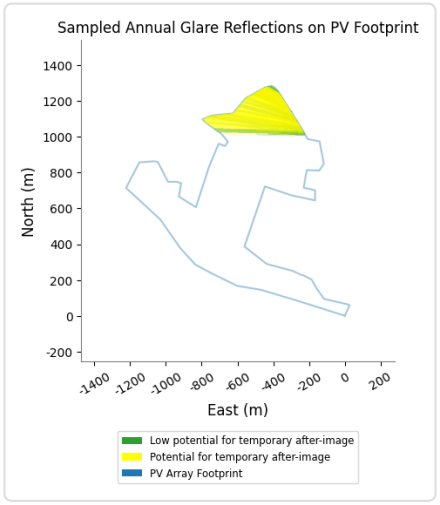
Yellow glare: 1,683 min.

Green glare: 876 min.





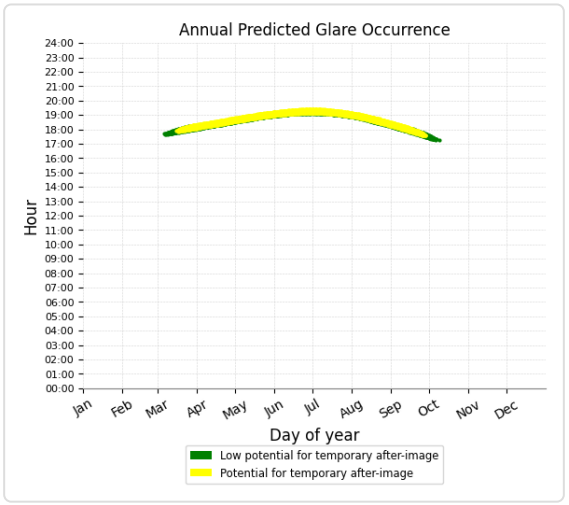


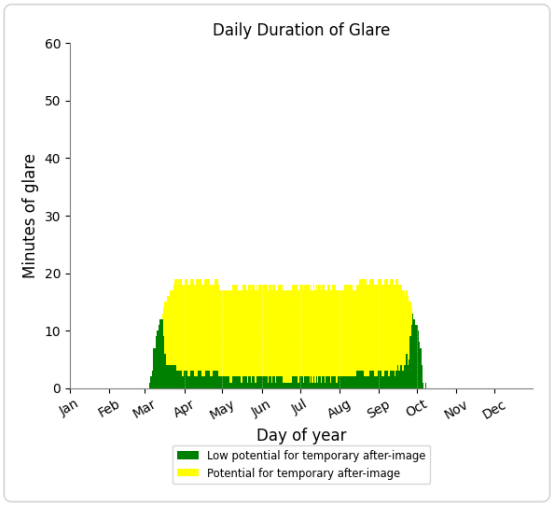


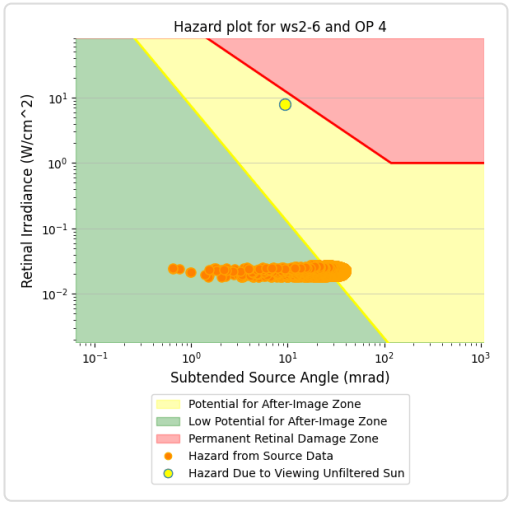
WS2 - 6 and OP 4

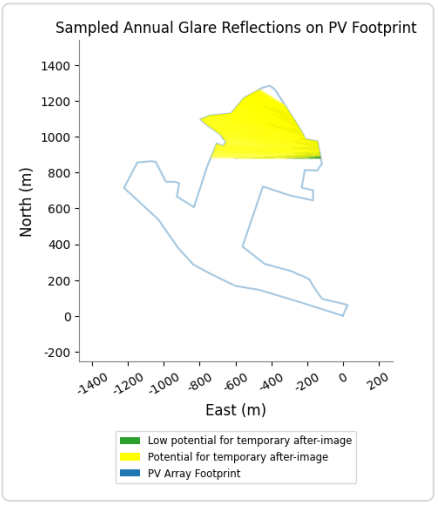
Yellow glare: 3,016 min.

Green glare: 637 min.





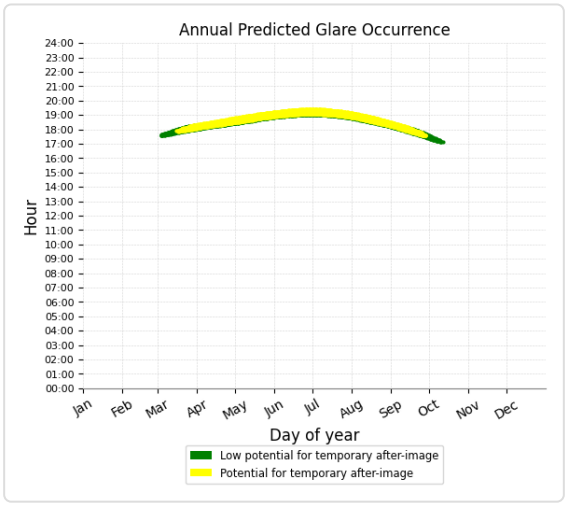


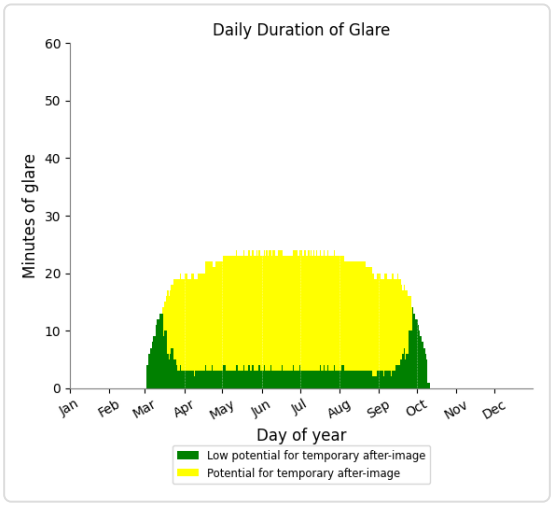


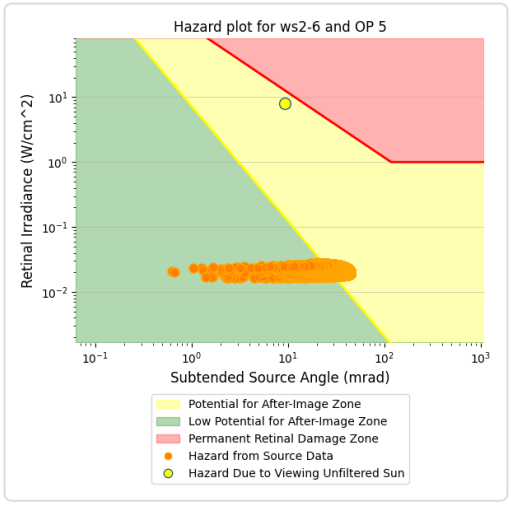
WS2 - 6 and OP 5

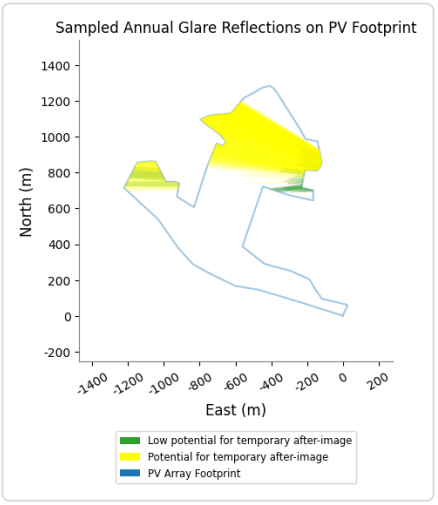
Yellow glare: 3,527 min.

Green glare: 927 min.





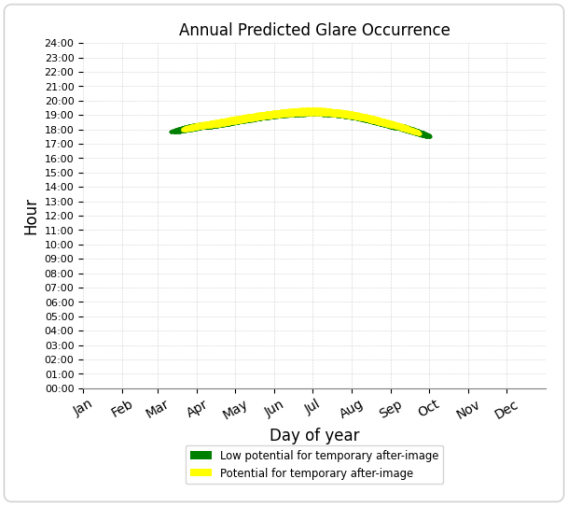


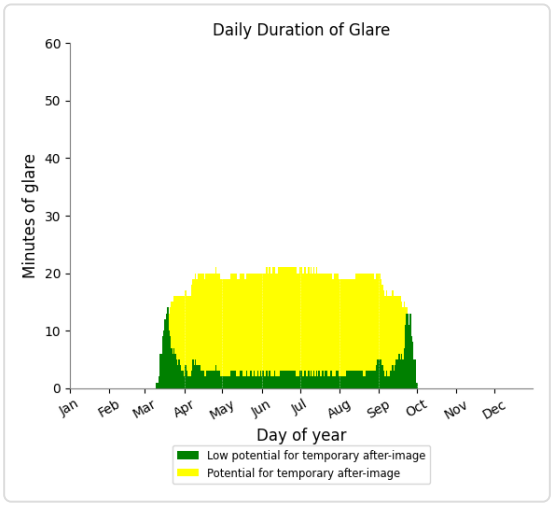


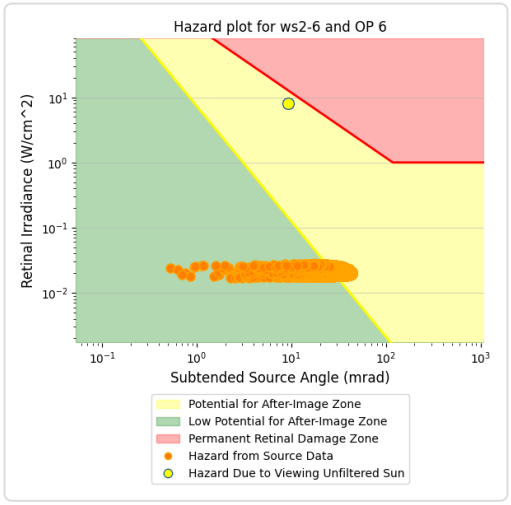
WS2 - 6 and OP 6

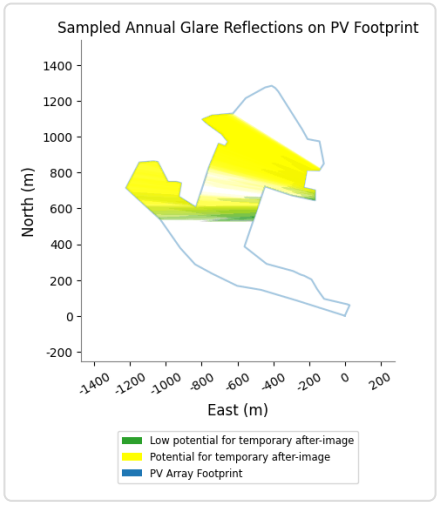
Yellow glare: 3,005 min.

Green glare: 727 min.





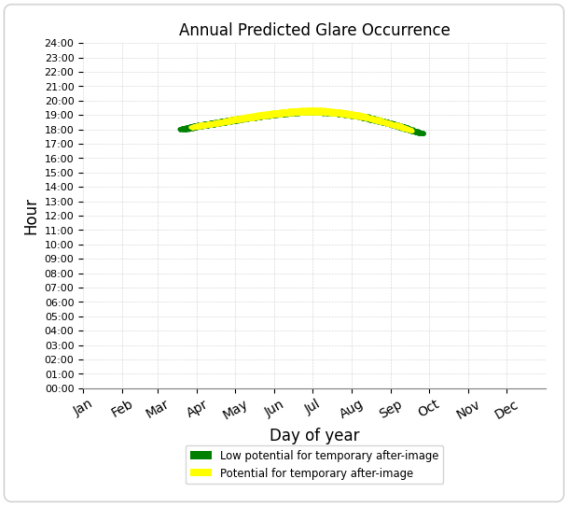


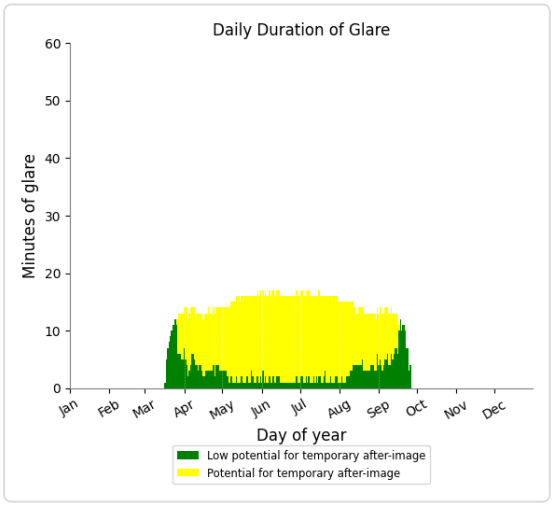


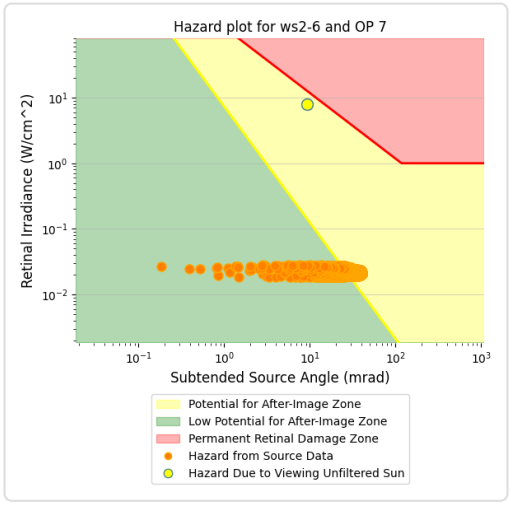
WS2 - 6 and OP 7

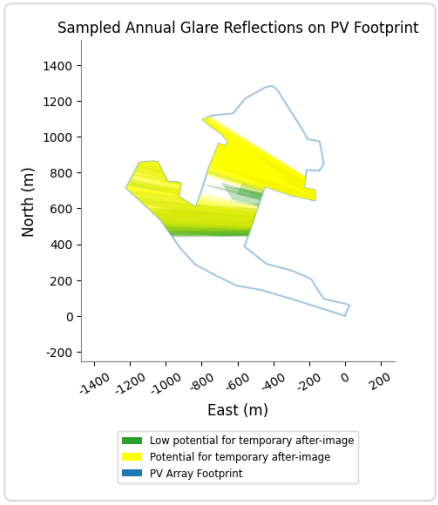
Yellow glare: 2,133 min.

Green glare: 619 min.





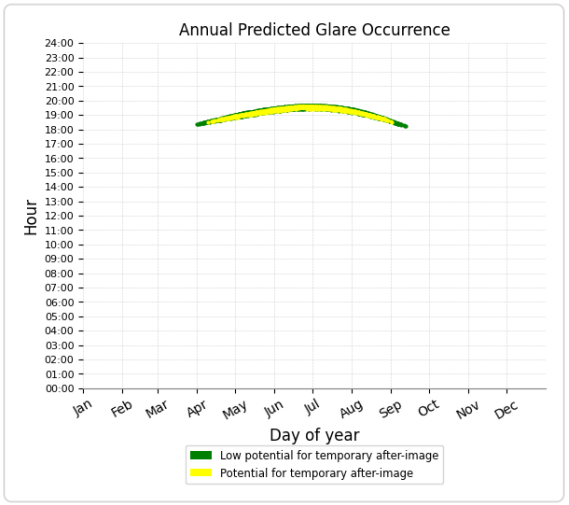


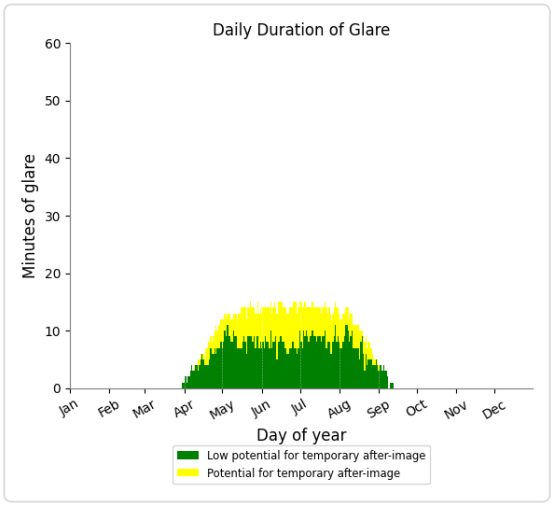


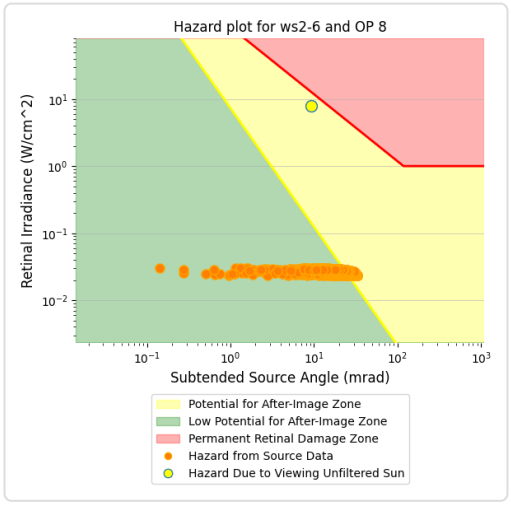
WS2 - 6 and OP 8

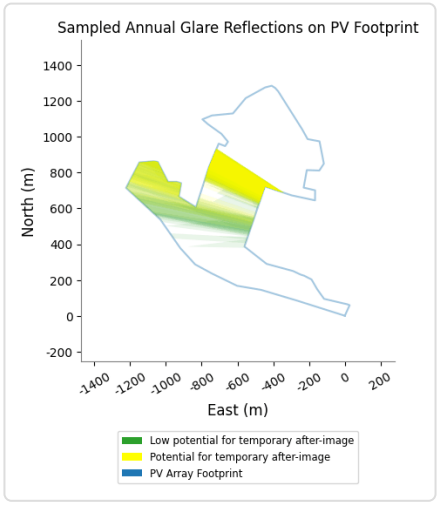
Yellow glare: 666 min.

Green glare: 1,126 min.





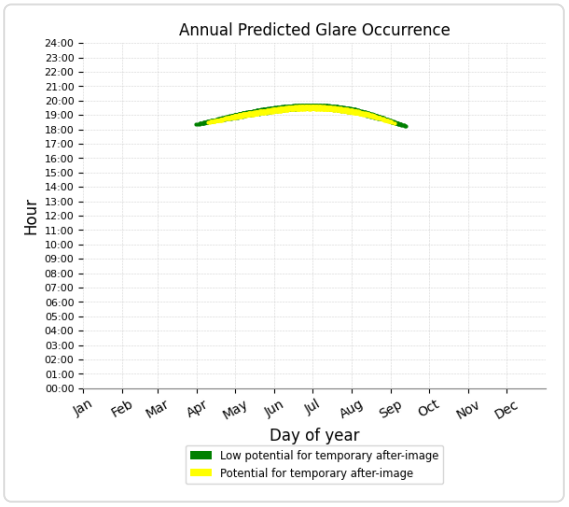


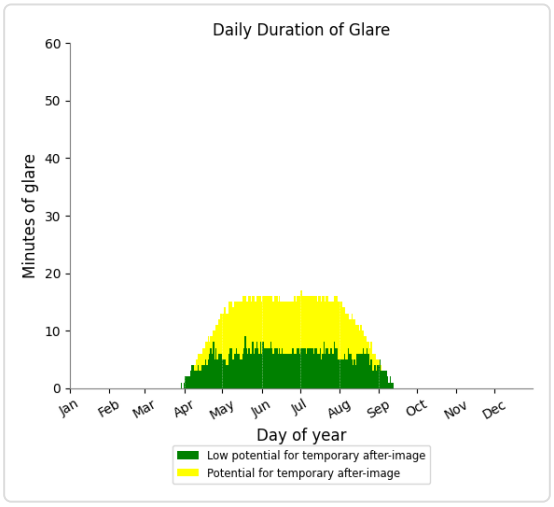


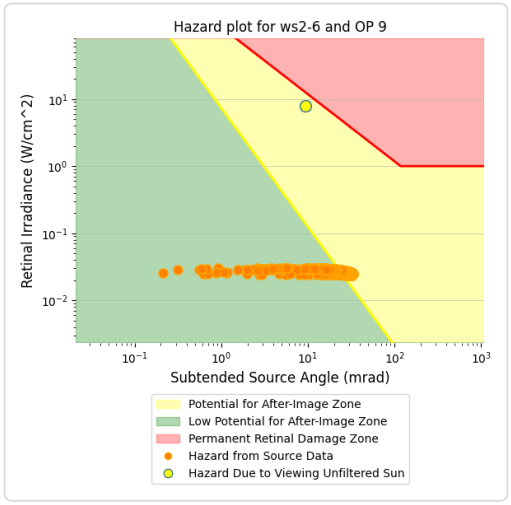
WS2 - 6 and OP 9

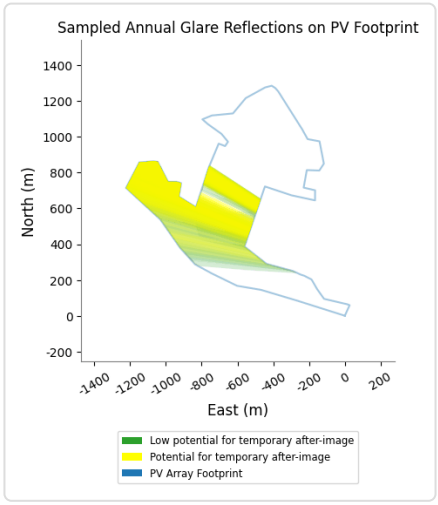
Yellow glare: 1,061 min.

Green glare: 917 min.





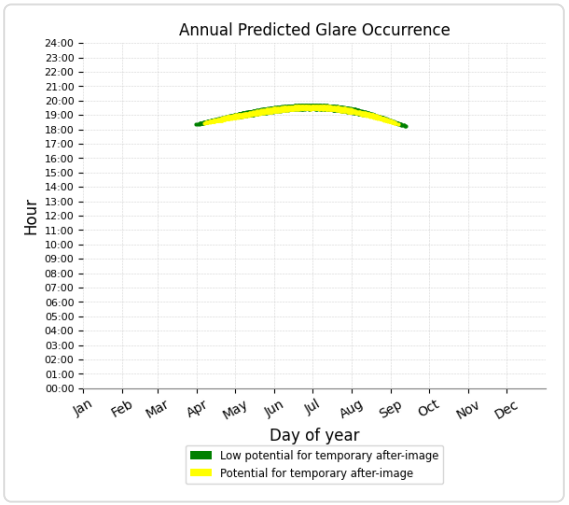


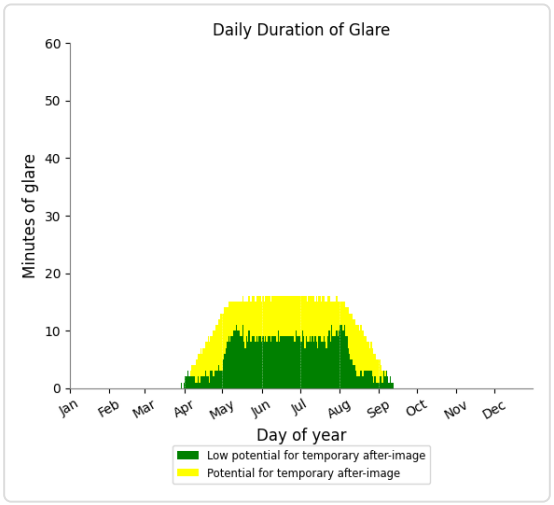


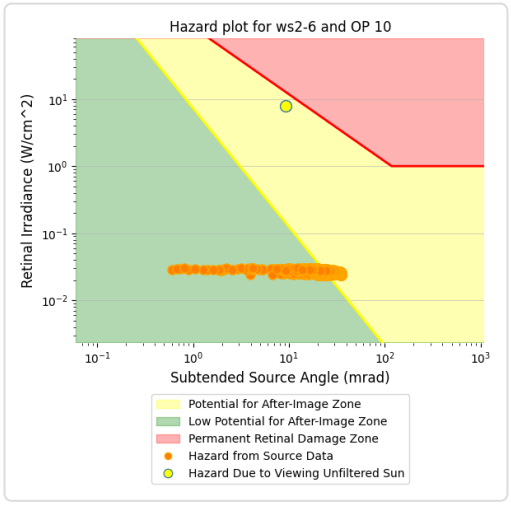
WS2 - 6 and OP 10

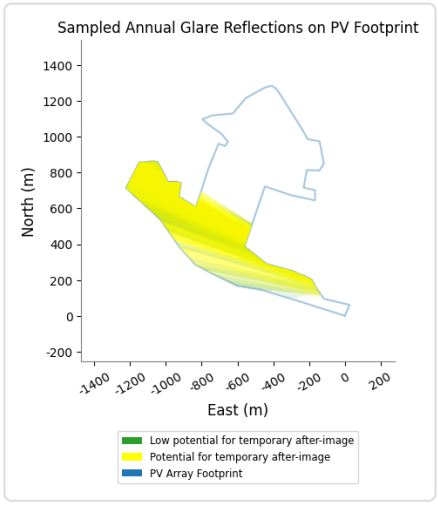
Yellow glare: 969 min.

Green glare: 1,027 min.





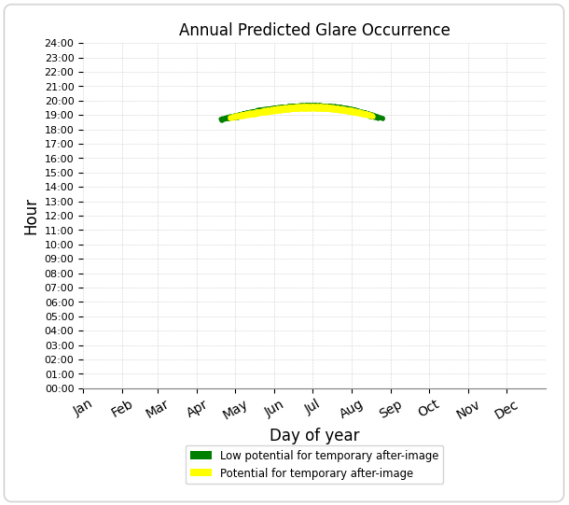


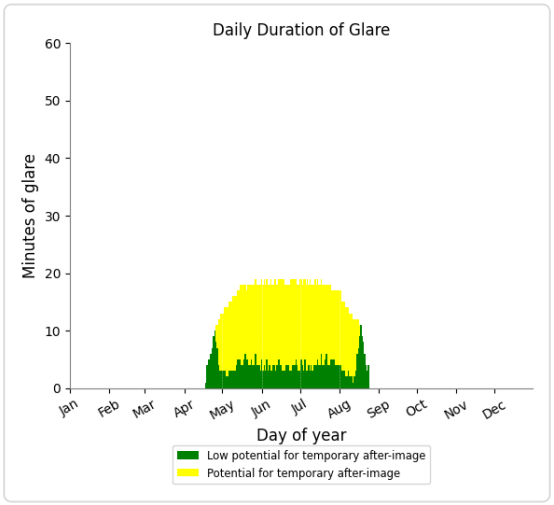


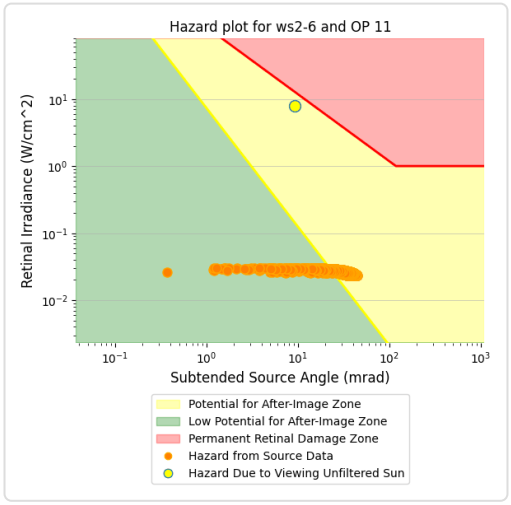
WS2 - 6 and OP 11

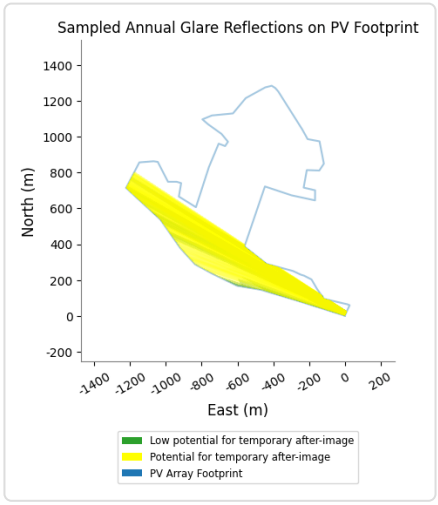
Yellow glare: 1,477 min.

Green glare: 539 min.





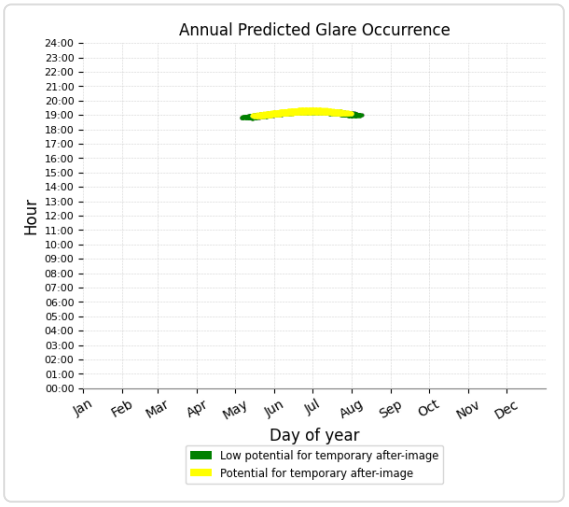


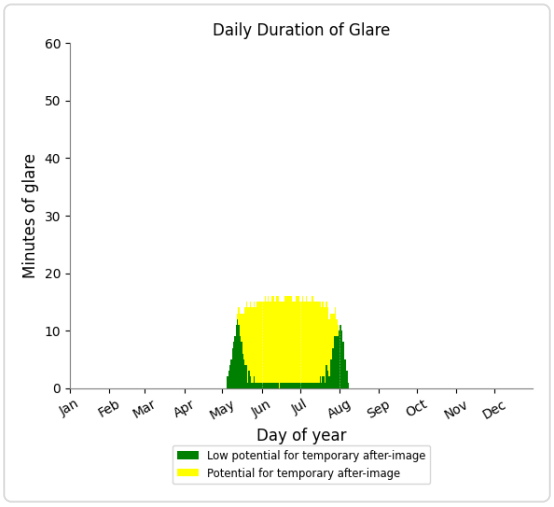


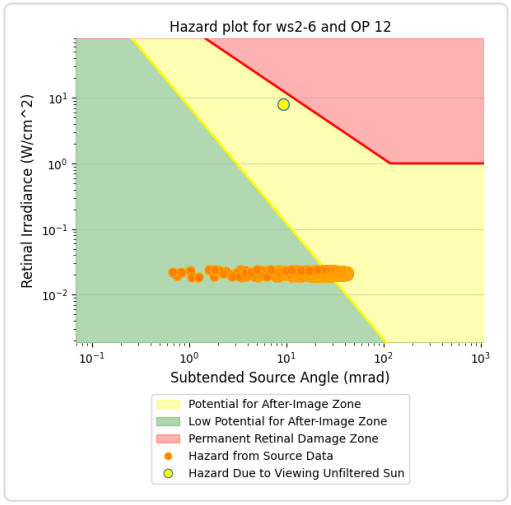
WS2 - 6 and OP 12

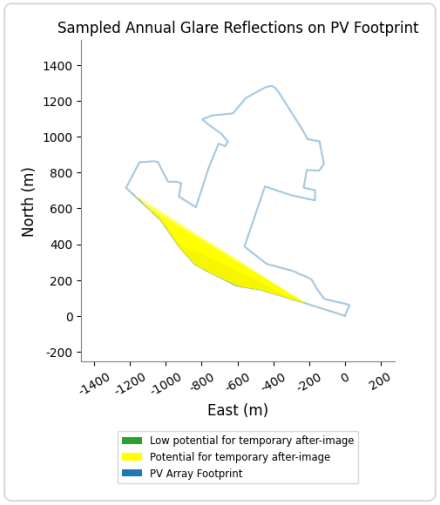
Yellow glare: 989 min.

Green glare: 291 min.





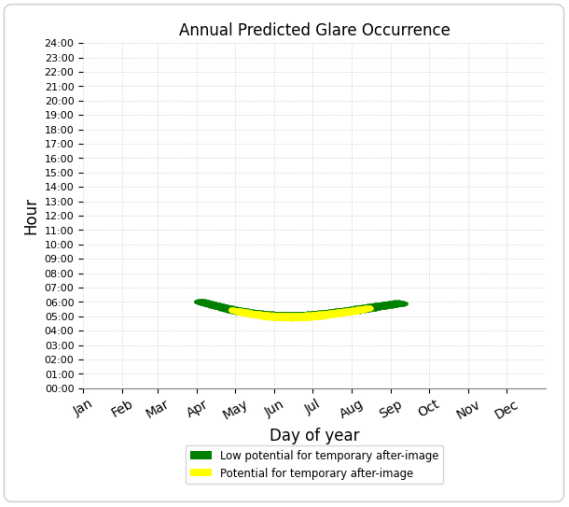


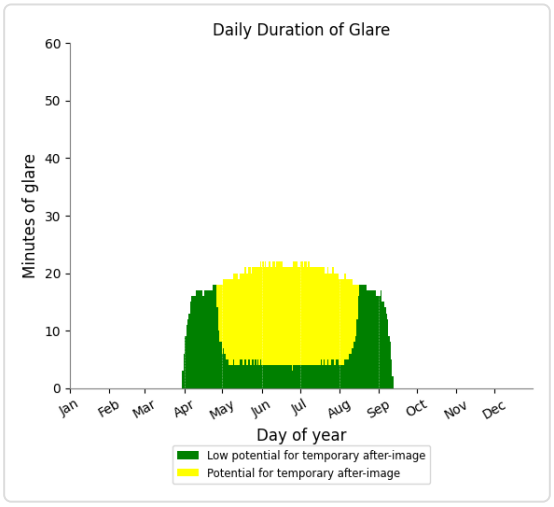


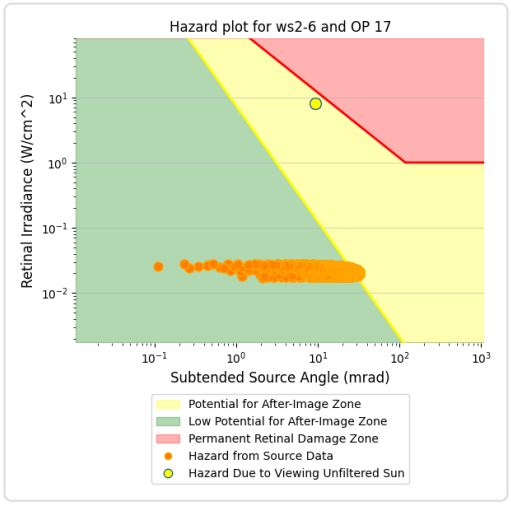
WS2 - 6 and OP 17

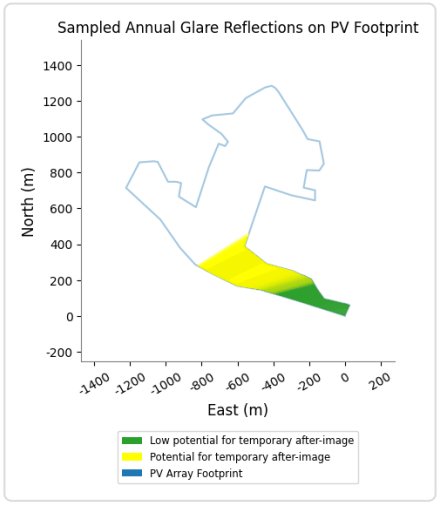
Yellow glare: 1,745 min.

Green glare: 1,347 min.





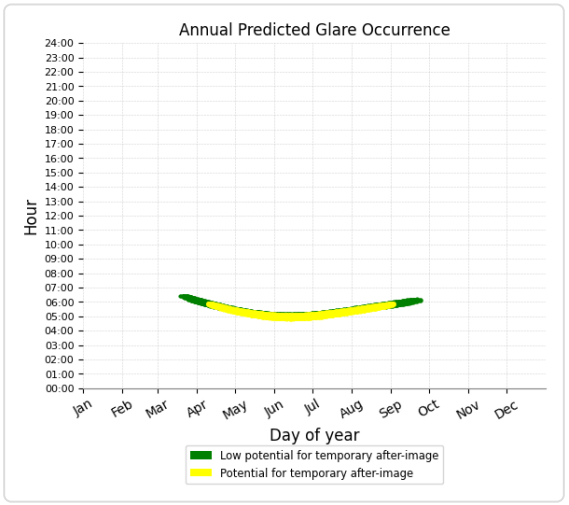


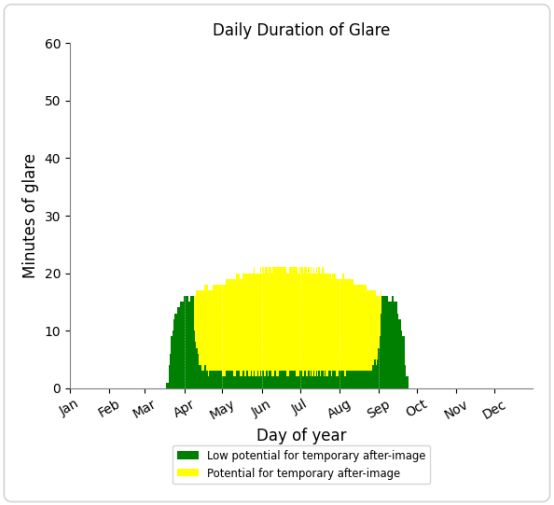


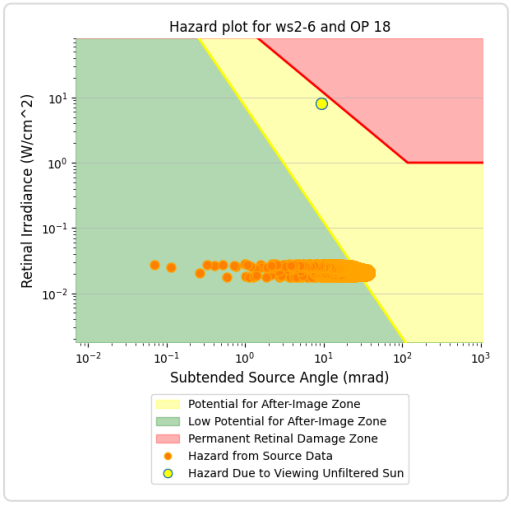
WS2 - 6 and OP 18

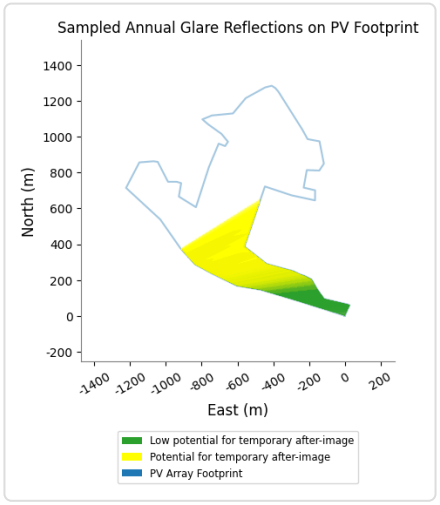
Yellow glare: 2,399 min.

Green glare: 977 min.





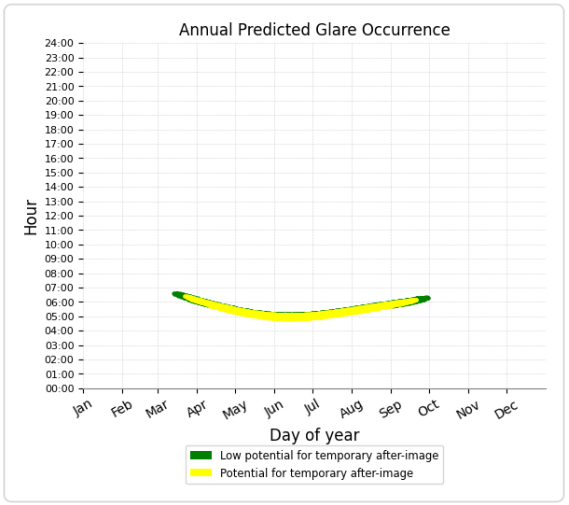


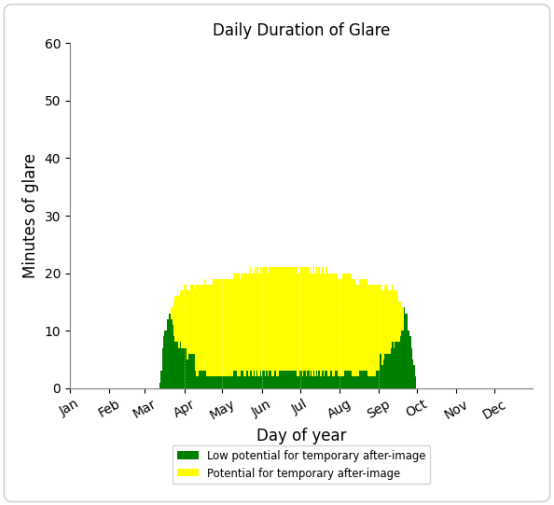


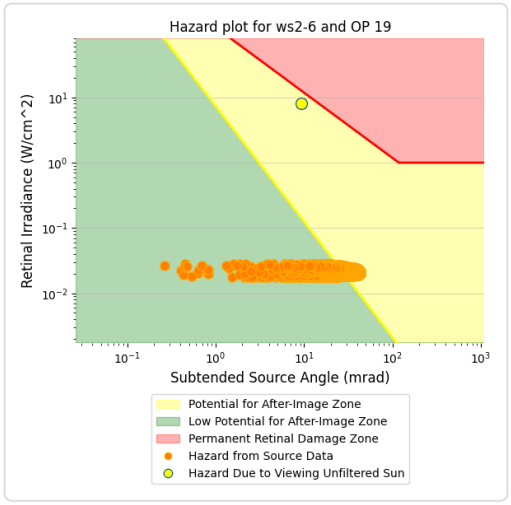
WS2 - 6 and OP 19

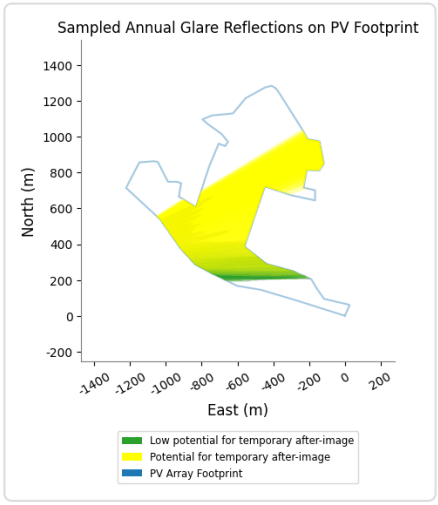
Yellow glare: 2,864 min.

Green glare: 801 min.





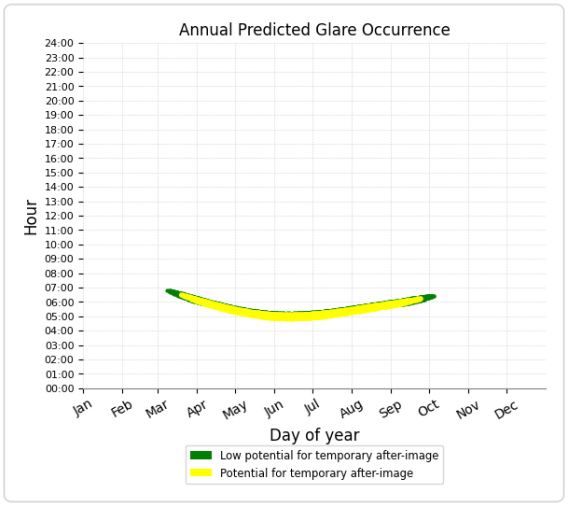


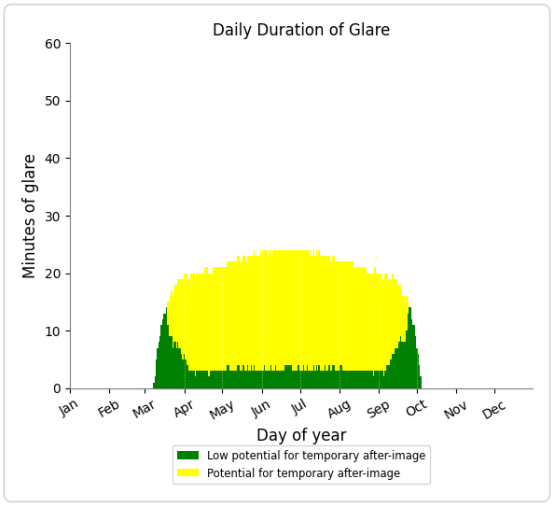


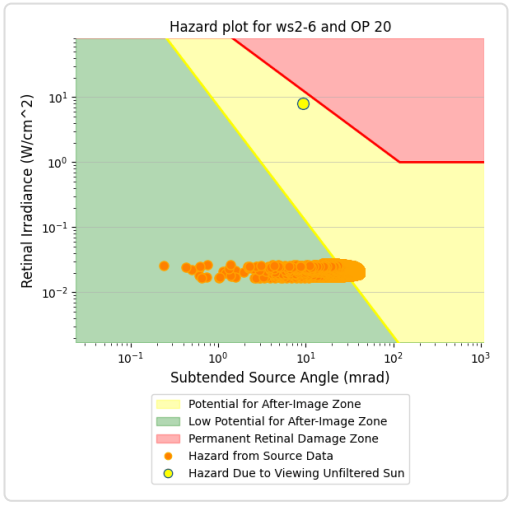
WS2 - 6 and OP 20

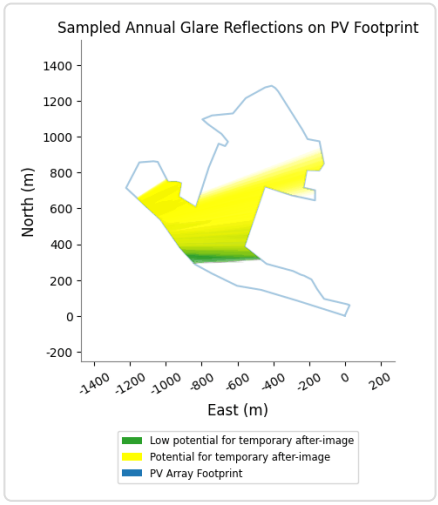
Yellow glare: 3,326 min.

Green glare: 922 min.





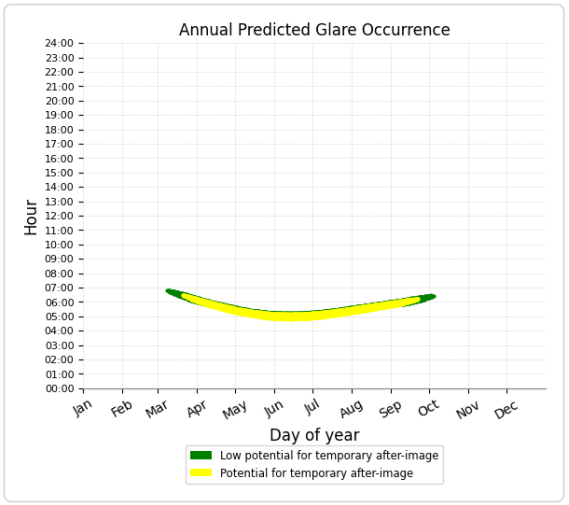


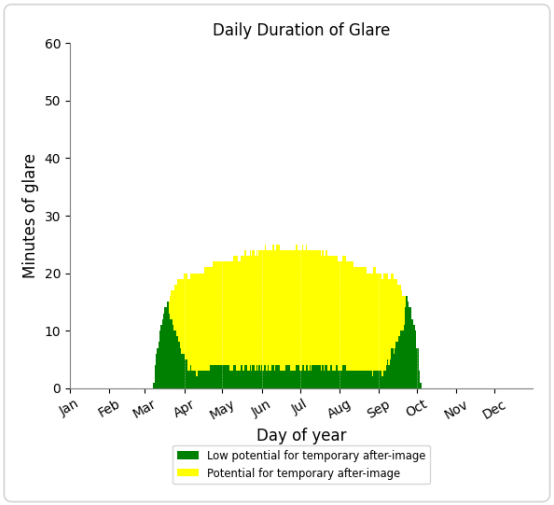


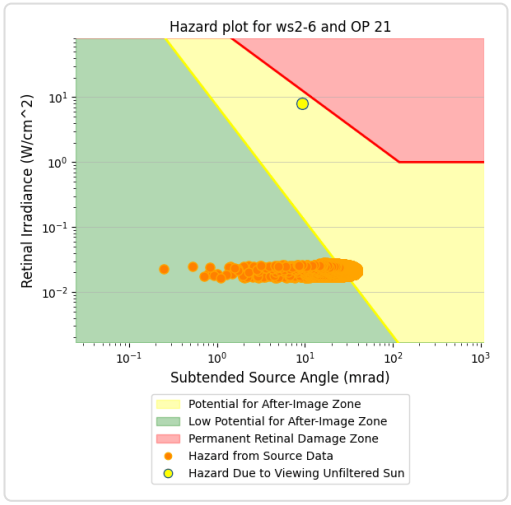
WS2 - 6 and OP 21

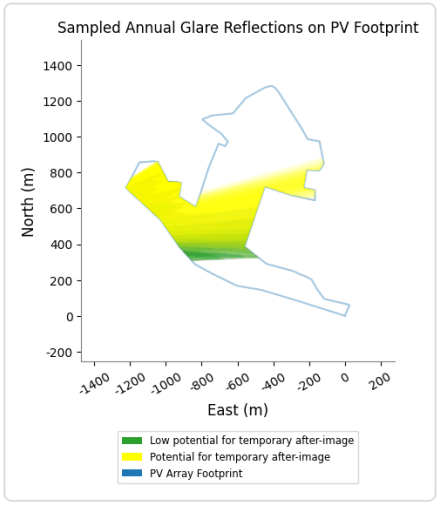
Yellow glare: 3,290 min.

Green glare: 1,020 min.





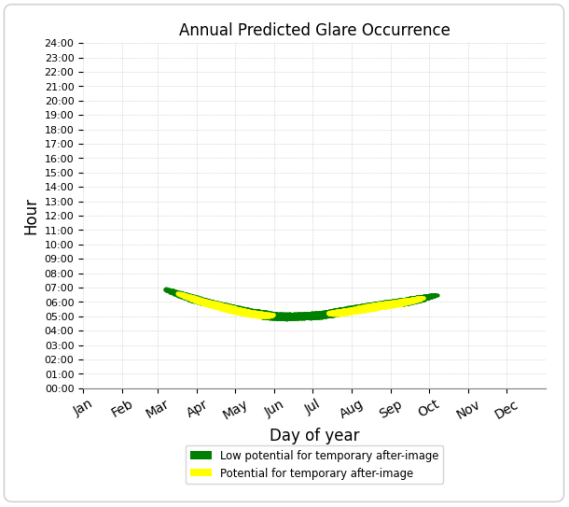


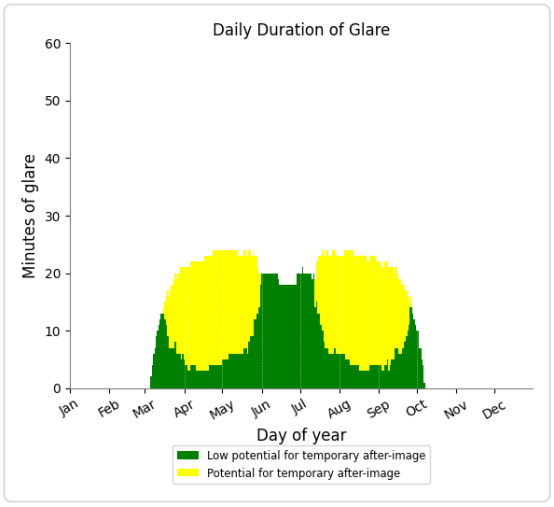


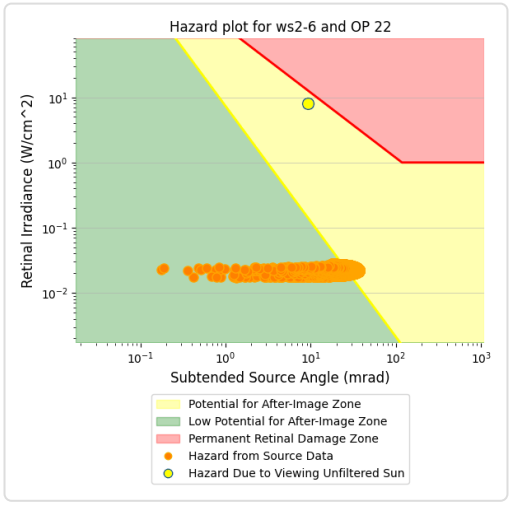
WS2 - 6 and OP 22

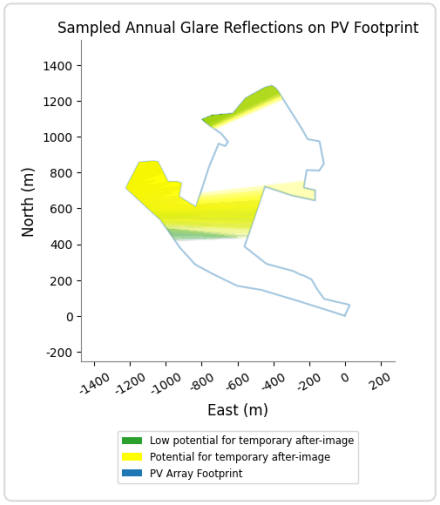
Yellow glare: 2,430 min.

Green glare: 1,920 min.





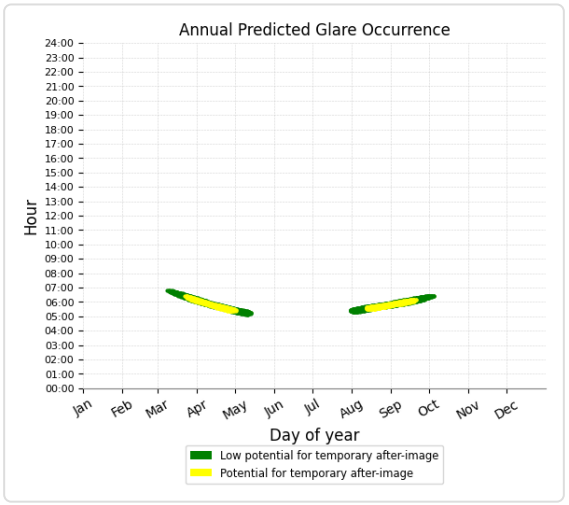


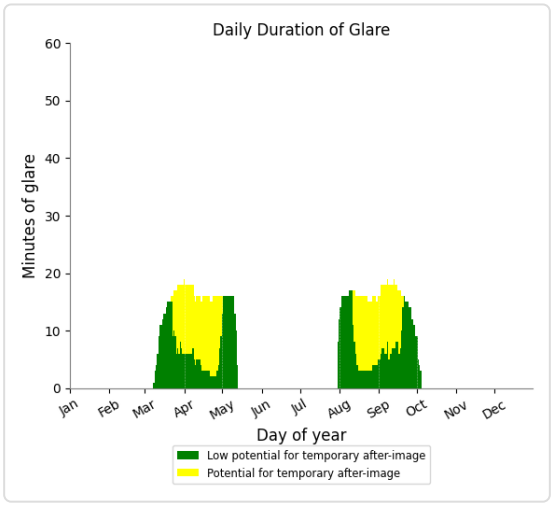


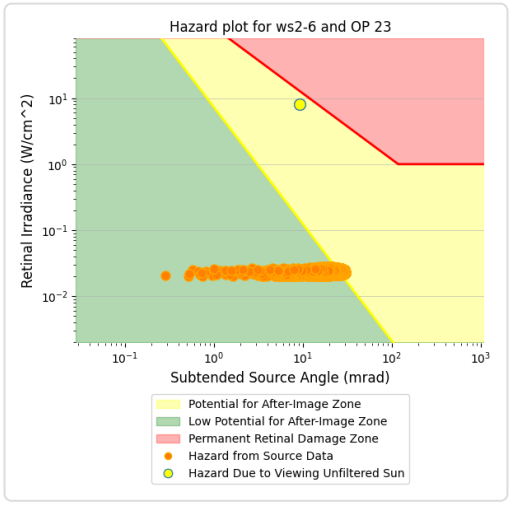
WS2 - 6 and OP 23

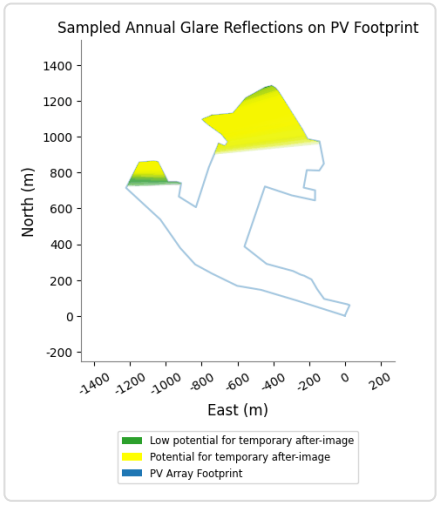
Yellow glare: 899 min.

Green glare: 1,098 min.





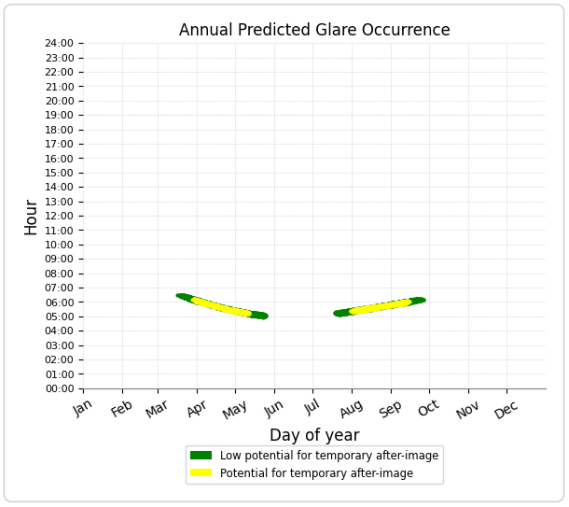


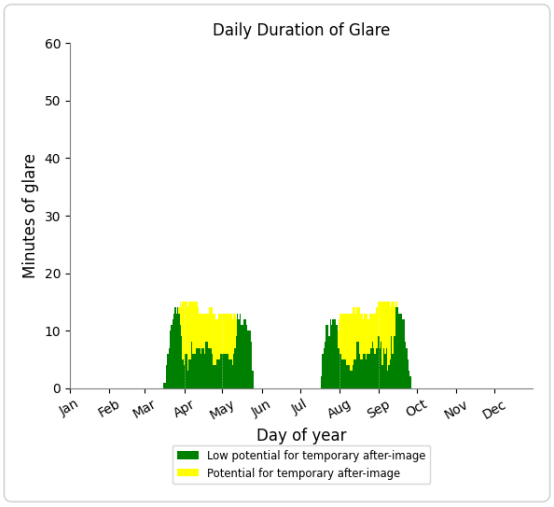


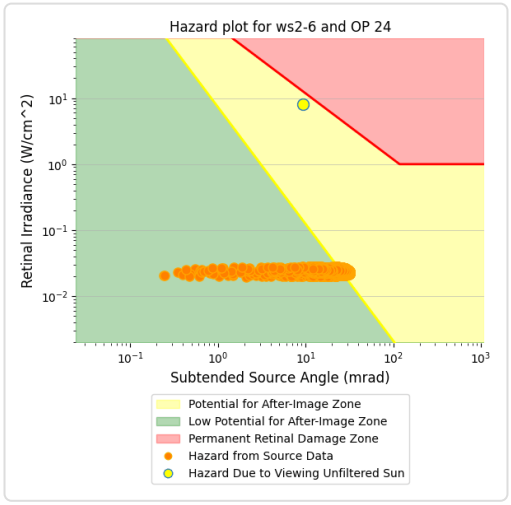
WS2 - 6 and OP 24

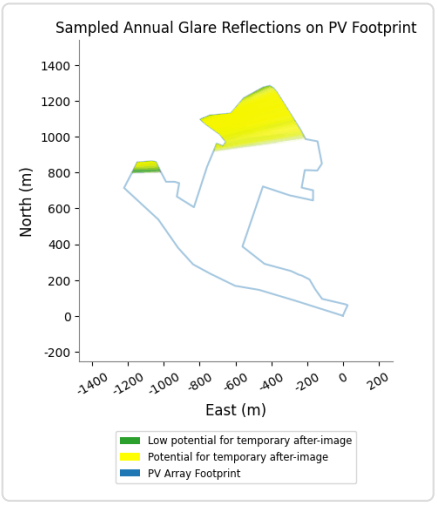
Yellow glare: 690 min.

Green glare: 1,043 min.





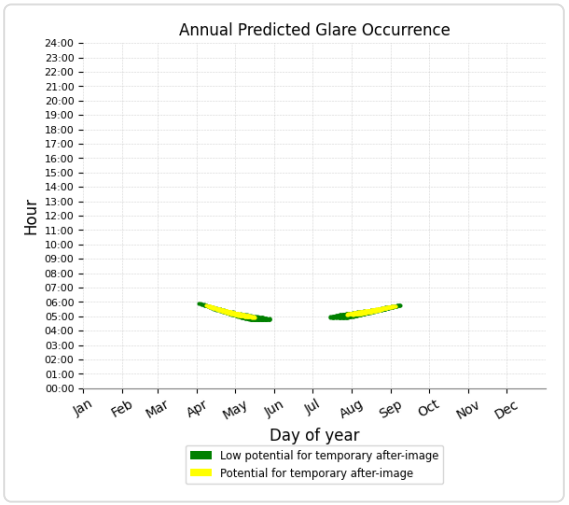


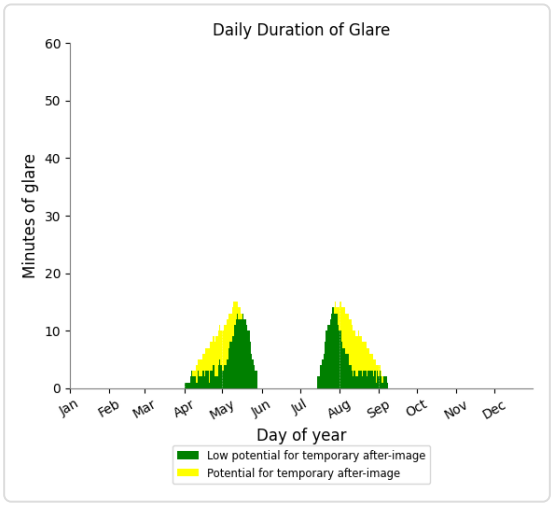


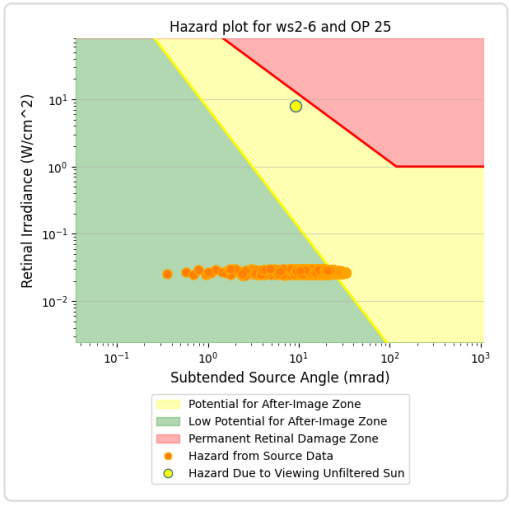
WS2 - 6 and OP 25

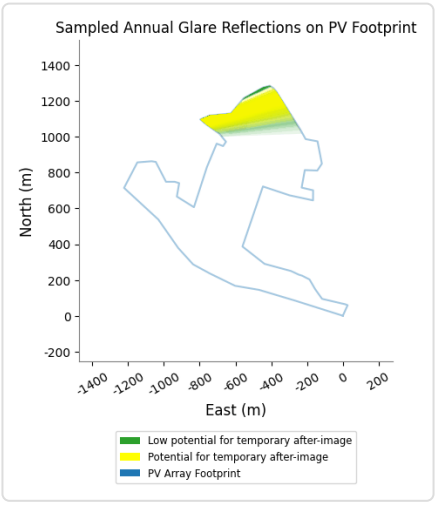
Yellow glare: 353 min.

Green glare: 588 min.





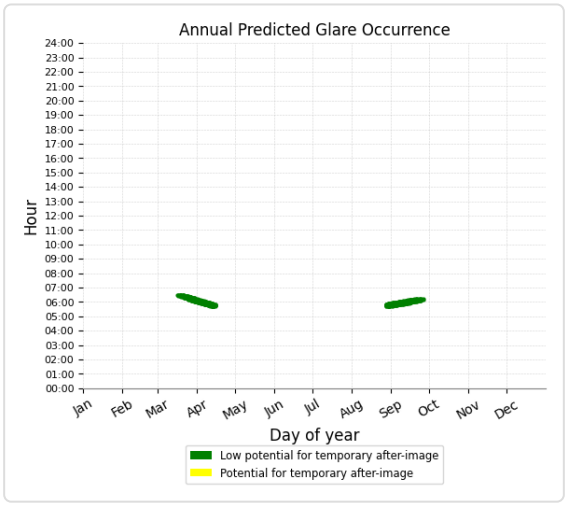


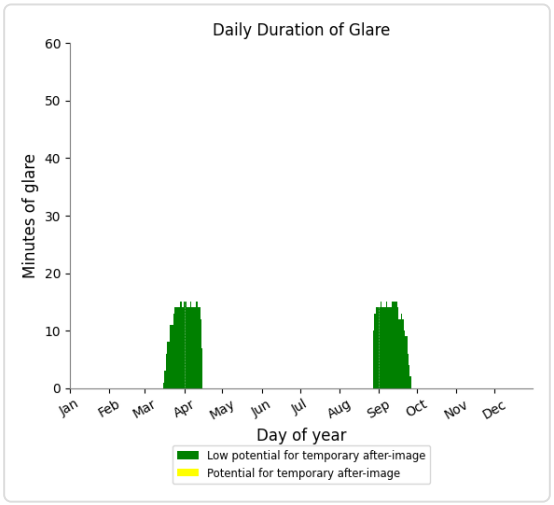


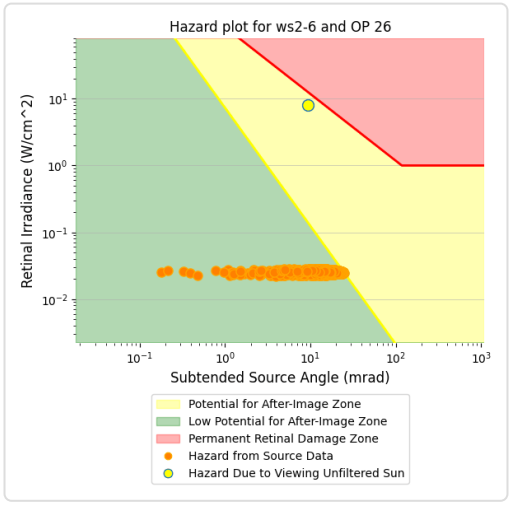
WS2 - 6 and OP 26

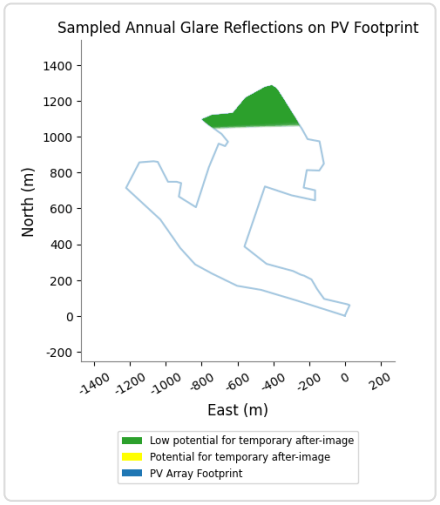
Yellow glare: none

Green glare: 747 min.









WS2 - 6 and OP 13

No glare found

WS2 - 6 and OP 14

No glare found

WS2 - 6 and OP 15

No glare found

WS2 - 6 and OP 16

No glare found

WS2 - 6 and OP 27

No glare found

WS2 - 6 and OP 28

No glare found

WS2 - 6 and OP 29

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **W2E**

Created 19 Jun, 2025
Updated 03 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 152629.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 6	25.0	180.0	15,713	261.9	51,805	863.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

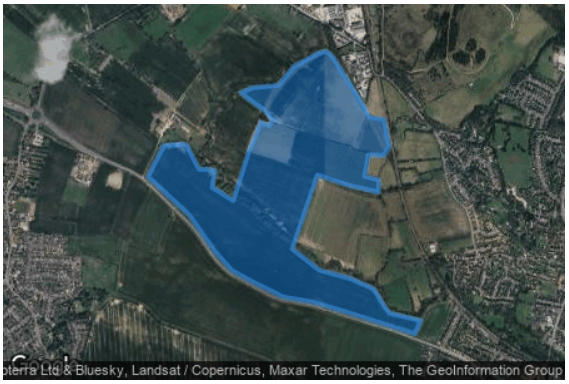
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1E	354	5.9	2,626	43.8
PRoW 2E	1,165	19.4	3,255	54.2
Route 1E	880	14.7	7,896	131.6
Route 2E	0	0.0	0	0.0
Route 3E	69	1.1	2,006	33.4
OP 1	836	13.9	1,061	17.7
OP 2	430	7.2	2,369	39.5
OP 3	496	8.3	1,504	25.1
OP 4	438	7.3	2,282	38.0
OP 5	589	9.8	2,679	44.6
OP 6	558	9.3	2,318	38.6
OP 7	438	7.3	1,680	28.0
OP 8	620	10.3	1,031	17.2
OP 9	336	5.6	1,529	25.5
OP 10	338	5.6	1,703	28.4
OP 11	231	3.9	1,097	18.3

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 12	461	7.7	152	2.5
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	1,136	18.9	1,223	20.4
OP 18	772	12.9	1,884	31.4
OP 19	522	8.7	2,277	38.0
OP 20	625	10.4	2,556	42.6
OP 21	721	12.0	2,541	42.4
OP 22	853	14.2	2,571	42.9
OP 23	843	14.1	1,061	17.7
OP 24	970	16.2	966	16.1
OP 25	376	6.3	1,522	25.4
OP 26	656	10.9	16	0.3
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

Component Data

PV Arrays

Name: WS2 - 6
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.351743	-1.229837	97.61	3.80	101.41
2	53.352505	-1.233861	94.53	3.80	98.33
3	53.353043	-1.236865	95.31	3.80	99.11
4	53.353248	-1.238882	95.00	3.80	98.80
5	53.353863	-1.240985	94.35	3.80	98.15
6	53.354324	-1.242401	94.20	3.80	98.00
7	53.355143	-1.243645	96.86	3.80	100.66
8	53.356578	-1.245319	96.64	3.80	100.44
9	53.358166	-1.248194	95.69	3.80	99.49
10	53.359446	-1.247079	93.04	3.80	96.84
11	53.359504	-1.245888	91.48	3.80	95.28
12	53.359472	-1.245534	91.40	3.80	95.20
13	53.358473	-1.244675	94.63	3.80	98.43
14	53.358473	-1.243946	93.46	3.80	97.26
15	53.358403	-1.243570	92.41	3.80	96.21
16	53.357730	-1.243763	95.81	3.80	99.61
17	53.357196	-1.242331	93.71	0.00	93.71
18	53.359209	-1.241242	96.14	3.80	99.94
19	53.360387	-1.240423	95.77	0.00	95.77
20	53.360265	-1.239884	96.51	0.00	96.51
21	53.360482	-1.239641	96.92	0.00	96.92
22	53.360877	-1.240185	95.55	3.80	99.35
23	53.361361	-1.241312	93.15	3.80	96.95
24	53.361607	-1.241789	92.53	3.80	96.33
25	53.361802	-1.240990	92.29	3.80	96.09
26	53.361905	-1.239225	94.46	3.80	98.26
27	53.362673	-1.238152	93.99	3.80	97.79
28	53.363211	-1.236521	95.54	3.80	99.34
29	53.363294	-1.235974	96.07	3.80	99.87
30	53.363185	-1.235685	96.63	3.80	100.43
31	53.363012	-1.235427	97.26	3.80	101.06
32	53.361110	-1.233421	100.05	3.80	103.85
33	53.360614	-1.232960	98.66	0.00	98.66
34	53.360502	-1.231962	97.03	0.00	97.03
35	53.359382	-1.231597	96.35	3.80	100.15
36	53.359036	-1.231978	96.15	3.80	99.95
37	53.359058	-1.233029	96.76	3.80	100.56
38	53.358178	-1.233292	96.16	3.80	99.96
39	53.358043	-1.232332	96.00	0.00	96.00
40	53.357538	-1.232337	96.00	3.80	99.80
41	53.357790	-1.234306	97.51	0.00	97.51
42	53.358236	-1.236543	100.48	3.80	104.28
43	53.355220	-1.238260	93.35	3.80	97.15
44	53.354349	-1.236406	93.10	0.00	93.10
45	53.353990	-1.234188	93.42	3.80	97.22
46	53.353808	-1.233539	92.47	3.80	96.27
47	53.353753	-1.233249	92.05	3.80	95.85
48	53.353564	-1.232632	92.25	3.80	96.05
49	53.353078	-1.232160	92.44	3.80	96.24
50	53.352591	-1.231581	93.45	3.80	97.25
51	53.352362	-1.229945	94.76	3.80	98.56
52	53.352322	-1.229647	95.16	3.80	98.96
53	53.352272	-1.229435	95.38	3.80	99.18
54	53.352056	-1.229602	96.29	3.80	100.09

Route Receptors

Name: PRoW 1E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.353338	-1.250292	109.02	2.75	111.77
2	53.352928	-1.248318	109.14	2.75	111.89
3	53.352108	-1.247202	110.97	2.75	113.72
4	53.350469	-1.239134	109.42	2.75	112.17
5	53.348522	-1.232783	117.41	2.75	120.16
6	53.348215	-1.230380	116.92	2.75	119.67

Name: PRoW 2E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.350898	-1.240432	106.18	2.75	108.93
2	53.353101	-1.238758	95.46	2.75	98.21

Name: Route 1E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361604	-1.261152	111.91	1.50	113.41
2	53.361182	-1.258427	107.16	1.50	108.66
3	53.360529	-1.255530	101.69	1.50	103.19
4	53.359440	-1.253127	100.33	1.50	101.83
5	53.358634	-1.250380	97.15	1.50	98.65
6	53.358109	-1.248513	95.90	1.50	97.40
7	53.356853	-1.246432	96.26	1.50	97.76
8	53.355560	-1.244415	96.64	1.50	98.14
9	53.354228	-1.242612	95.16	1.50	96.66
10	53.353344	-1.240016	95.11	1.50	96.61
11	53.352819	-1.237055	96.04	1.50	97.54
12	53.352384	-1.234137	95.28	1.50	96.78
13	53.351782	-1.231175	96.49	1.50	97.99
14	53.351180	-1.228300	99.14	1.50	100.64

Name: Route 2E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.361068	-1.255661	103.45	1.50	104.95
2	53.362746	-1.254695	97.96	1.50	99.46
3	53.363309	-1.254363	95.56	1.50	97.06
4	53.364148	-1.251648	97.18	1.50	98.68
5	53.365057	-1.248998	95.03	1.50	96.53
6	53.365947	-1.246370	98.14	1.50	99.64
7	53.366830	-1.243795	99.54	1.50	101.04

Name: Route 3E
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.364218	-1.232959	98.37	2.75	101.12
2	53.362413	-1.232412	99.30	2.75	102.05
3	53.360665	-1.231832	97.11	2.75	99.86
4	53.358885	-1.231210	96.92	2.75	99.67
5	53.357137	-1.230566	96.93	2.75	99.68
6	53.355485	-1.229601	94.67	2.75	97.42
7	53.353935	-1.228131	94.61	2.75	97.36
8	53.352597	-1.226232	94.64	2.75	97.39
9	53.351438	-1.223914	94.78	2.75	97.53

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.362764	-1.233919	98.85	2.00
OP 2	2	53.361855	-1.233265	100.01	2.00
OP 3	3	53.360899	-1.229595	100.65	2.00
OP 4	4	53.359958	-1.228265	104.67	2.00
OP 5	5	53.358549	-1.227579	109.03	2.00
OP 6	6	53.357146	-1.226441	110.23	2.00
OP 7	7	53.355968	-1.225672	104.08	2.00
OP 8	8	53.354881	-1.227260	97.13	2.00
OP 9	9	53.353340	-1.226123	94.43	2.00
OP 10	10	53.352334	-1.227159	95.08	2.00
OP 11	11	53.351396	-1.228210	98.18	2.00
OP 12	12	53.350835	-1.229028	101.94	2.00
OP 13	13	53.349148	-1.230235	118.33	2.00
OP 14	14	53.346631	-1.228615	119.19	2.00
OP 15	15	53.345757	-1.229146	120.57	2.00
OP 16	16	53.344991	-1.230213	120.21	2.00
OP 17	17	53.350155	-1.253304	119.31	2.00
OP 18	18	53.351881	-1.252339	112.24	2.00
OP 19	19	53.354058	-1.252915	109.26	2.00
OP 20	20	53.355259	-1.253838	112.85	2.00
OP 21	21	53.355586	-1.256209	116.11	2.00
OP 22	22	53.356789	-1.257491	119.65	2.00
OP 23	23	53.358922	-1.256526	108.43	2.00
OP 24	24	53.359005	-1.252706	99.04	2.00
OP 25	25	53.360420	-1.246237	93.88	2.00
OP 26	26	53.361483	-1.255925	104.77	2.00
OP 27	27	53.363387	-1.252577	95.68	2.00
OP 28	28	53.364642	-1.249358	96.02	2.00
OP 29	29	53.365564	-1.246659	97.16	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
WS2 - 6	25.0	180.0	15,713	261.9	51,805	863.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1E	354	5.9	2,626	43.8
PRoW 2E	1,165	19.4	3,255	54.2
Route 1E	880	14.7	7,896	131.6
Route 2E	0	0.0	0	0.0
Route 3E	69	1.1	2,006	33.4
OP 1	836	13.9	1,061	17.7
OP 2	430	7.2	2,369	39.5
OP 3	496	8.3	1,504	25.1
OP 4	438	7.3	2,282	38.0
OP 5	589	9.8	2,679	44.6
OP 6	558	9.3	2,318	38.6
OP 7	438	7.3	1,680	28.0
OP 8	620	10.3	1,031	17.2
OP 9	336	5.6	1,529	25.5
OP 10	338	5.6	1,703	28.4
OP 11	231	3.9	1,097	18.3
OP 12	461	7.7	152	2.5
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	1,136	18.9	1,223	20.4
OP 18	772	12.9	1,884	31.4
OP 19	522	8.7	2,277	38.0
OP 20	625	10.4	2,556	42.6
OP 21	721	12.0	2,541	42.4
OP 22	853	14.2	2,571	42.9
OP 23	843	14.1	1,061	17.7
OP 24	970	16.2	966	16.1
OP 25	376	6.3	1,522	25.4
OP 26	656	10.9	16	0.3
OP 27	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

PV: WS2 - 6 potential temporary after-image

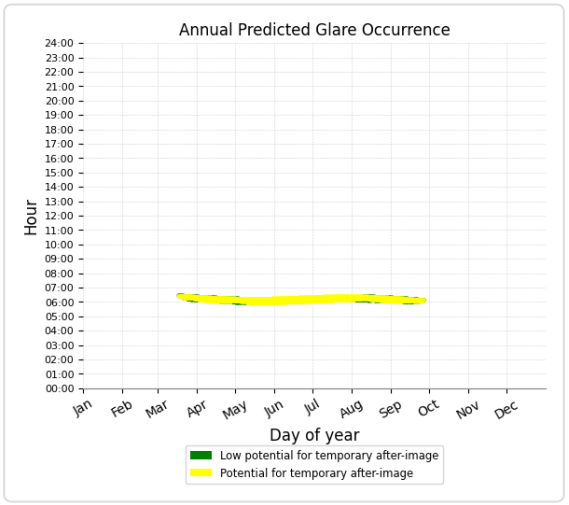
Receptor results ordered by category of glare

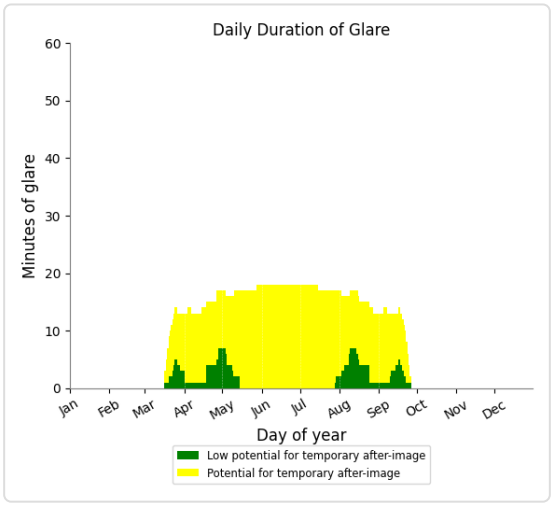
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1E	354	5.9	2,626	43.8
PRoW 2E	1,165	19.4	3,255	54.2
Route 1E	880	14.7	7,896	131.6
Route 3E	69	1.1	2,006	33.4
Route 2E	0	0.0	0	0.0
OP 1	836	13.9	1,061	17.7
OP 2	430	7.2	2,369	39.5
OP 3	496	8.3	1,504	25.1
OP 4	438	7.3	2,282	38.0
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OP 6	558	9.3	2,318	38.6
OP 7	438	7.3	1,680	28.0
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OP 18	772	12.9	1,884	31.4
OP 19	522	8.7	2,277	38.0
OP 20	625	10.4	2,556	42.6
OP 21	721	12.0	2,541	42.4
OP 22	853	14.2	2,571	42.9
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OP 24	970	16.2	966	16.1
OP 25	376	6.3	1,522	25.4
OP 26	656	10.9	16	0.3
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

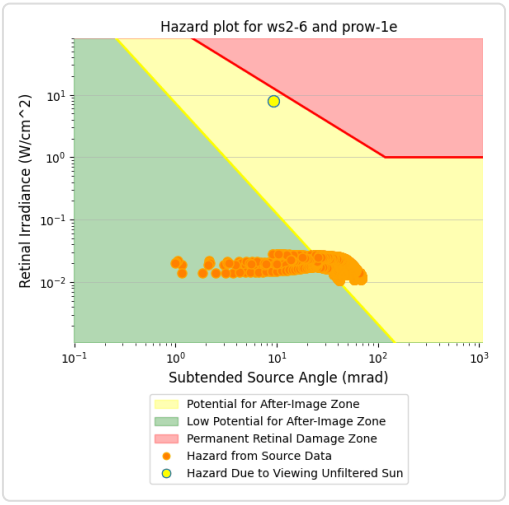
WS2 - 6 and Route: PRoW 1E

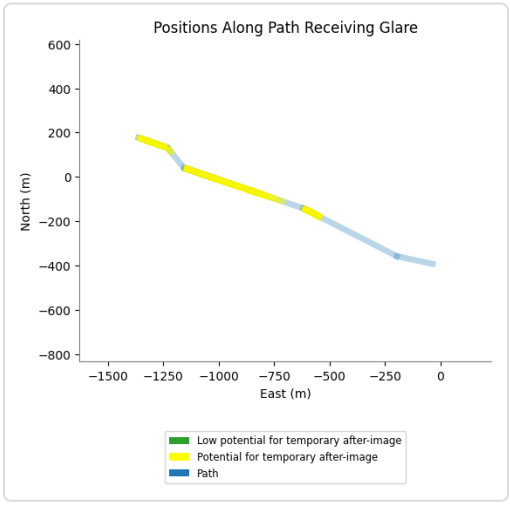
Yellow glare: 2,626 min.

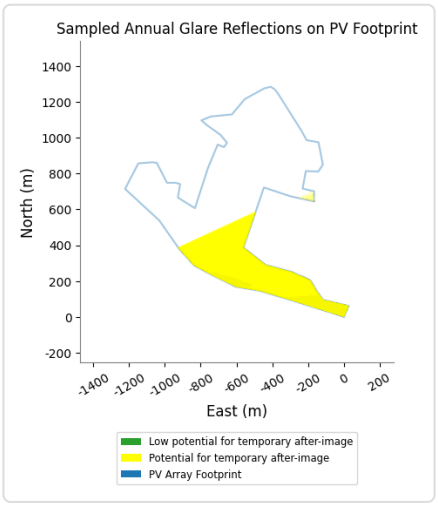
Green glare: 354 min.







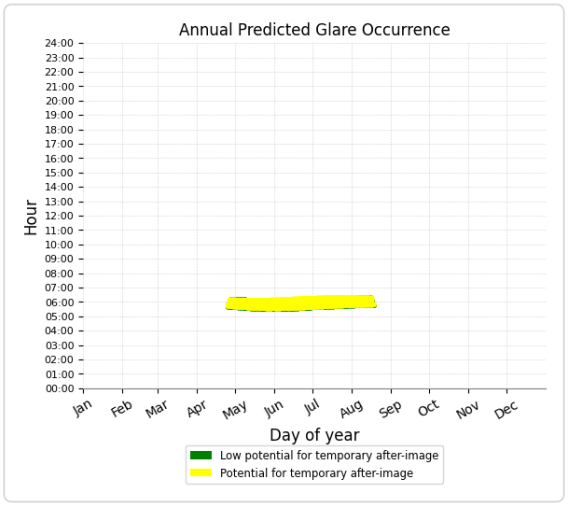


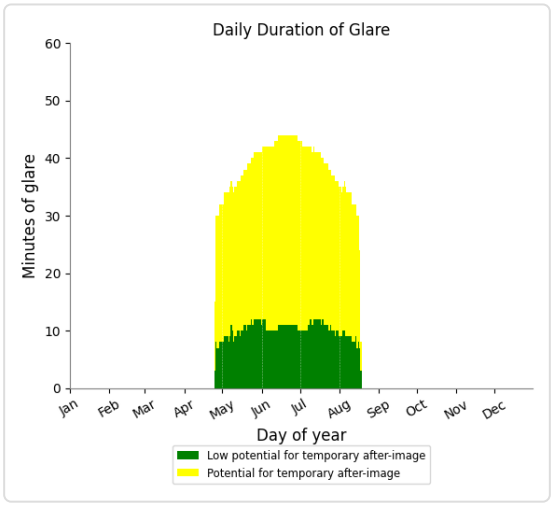


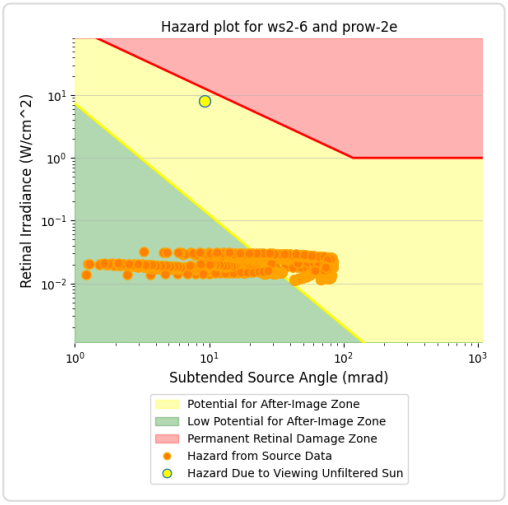
WS2 - 6 and Route: PRoW 2E

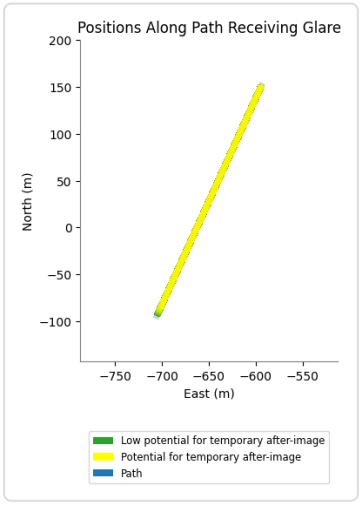
Yellow glare: 3,255 min.

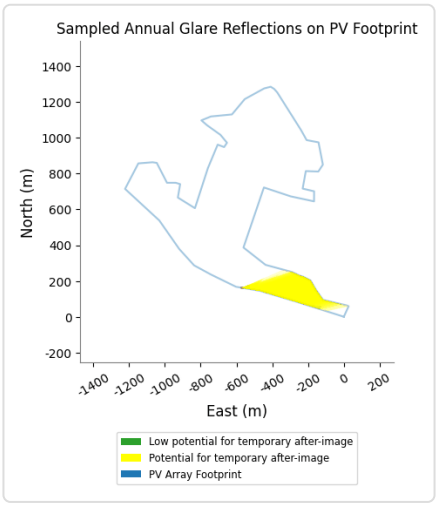
Green glare: 1,165 min.







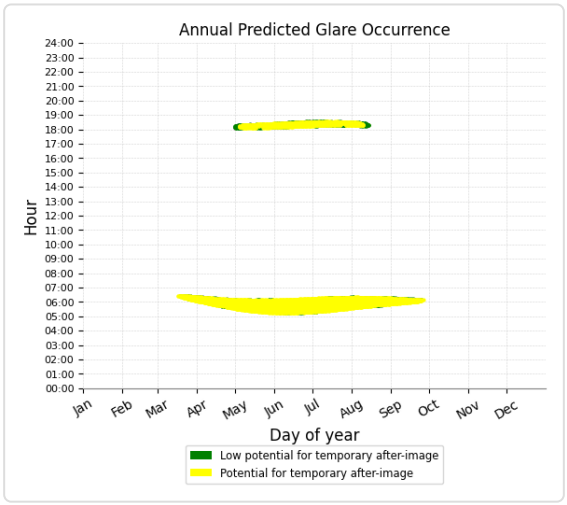


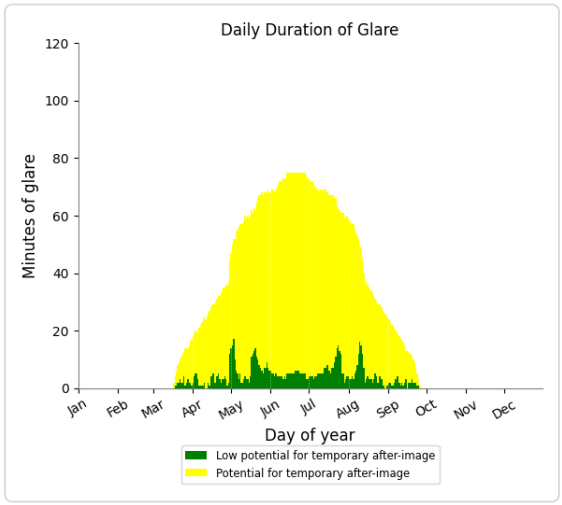


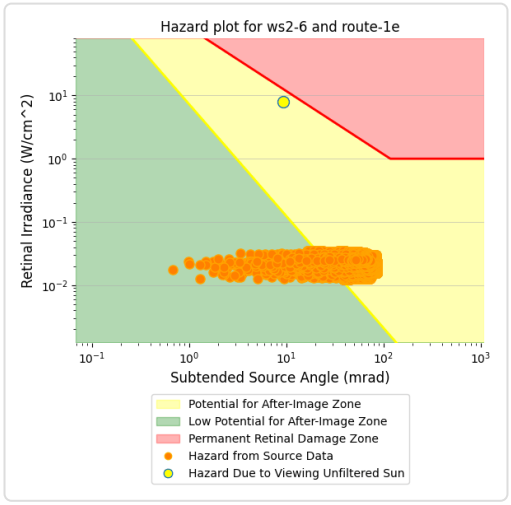
WS2 - 6 and Route: Route 1E

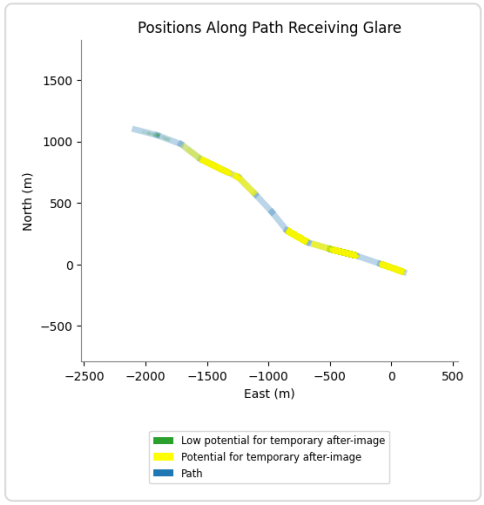
Yellow glare: 7,896 min.

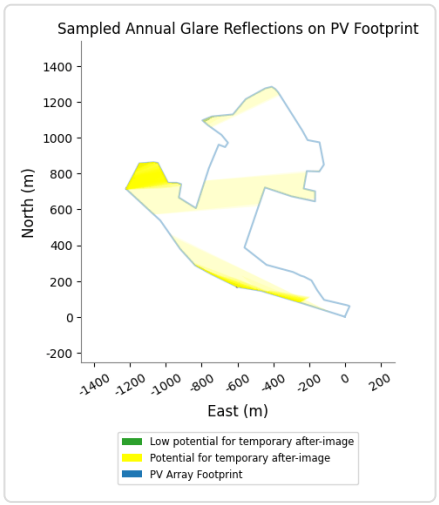
Green glare: 880 min.







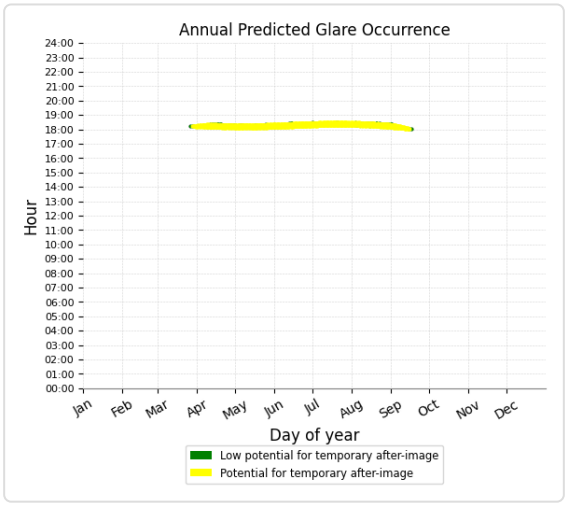


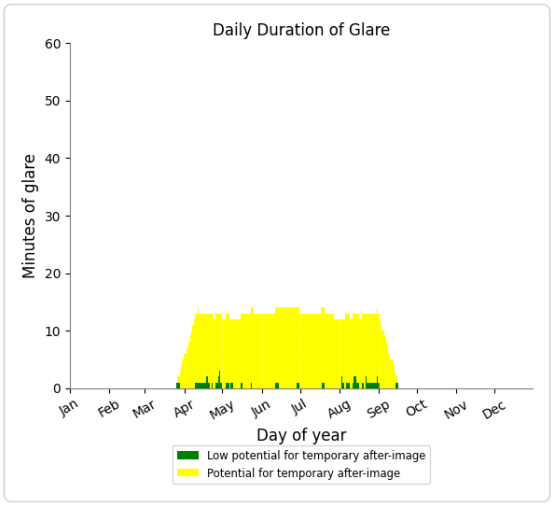


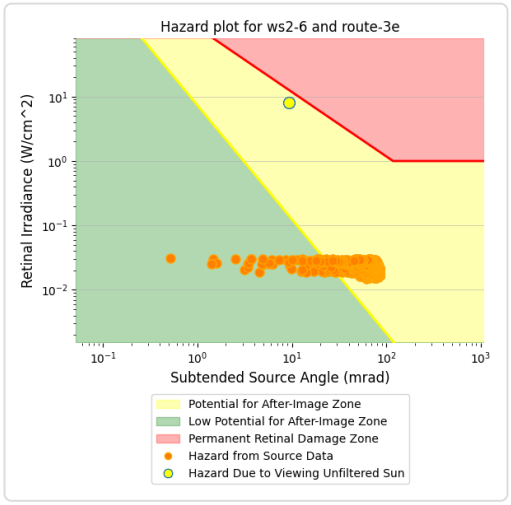
WS2 - 6 and Route: Route 3E

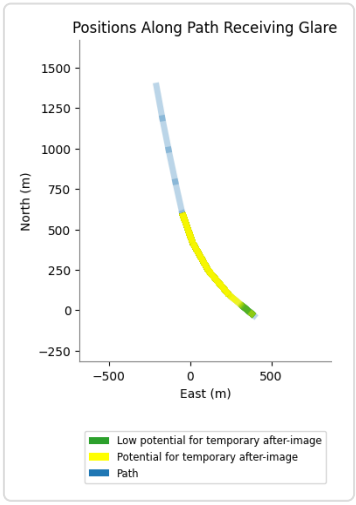
Yellow glare: 2,006 min.

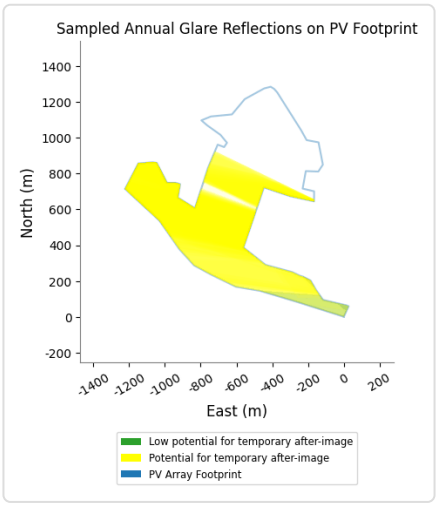
Green glare: 69 min.











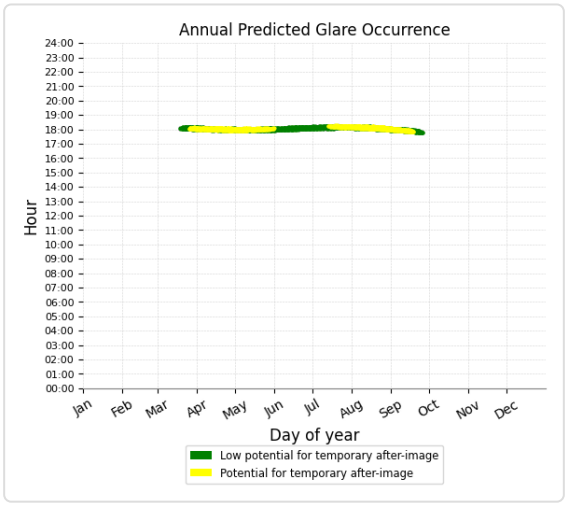
WS2 - 6 and Route: Route 2E

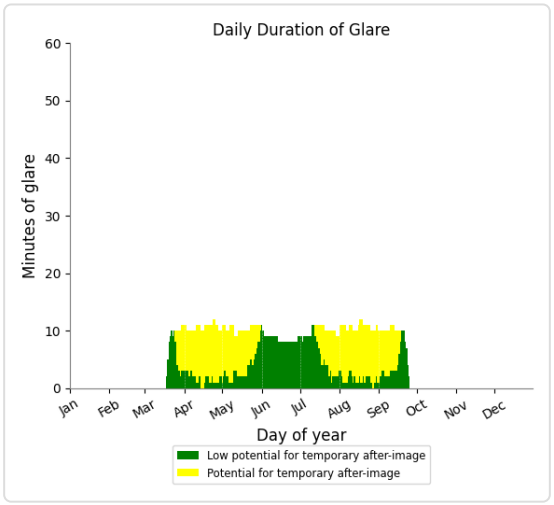
No glare found

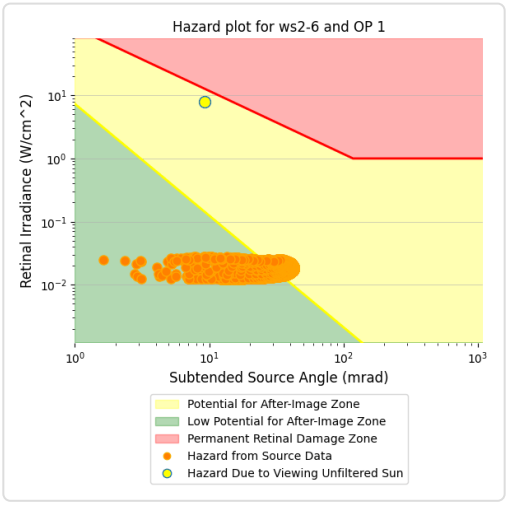
WS2 - 6 and OP 1

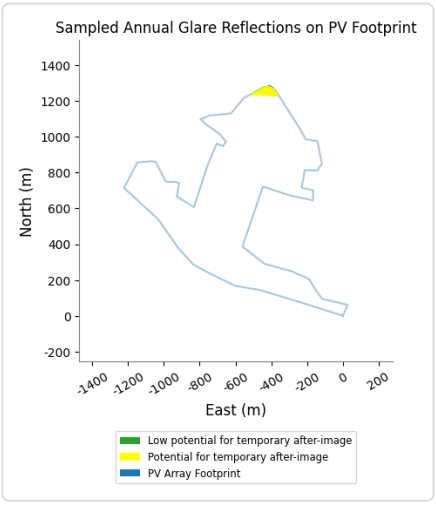
Yellow glare: 1,061 min.

Green glare: 836 min.





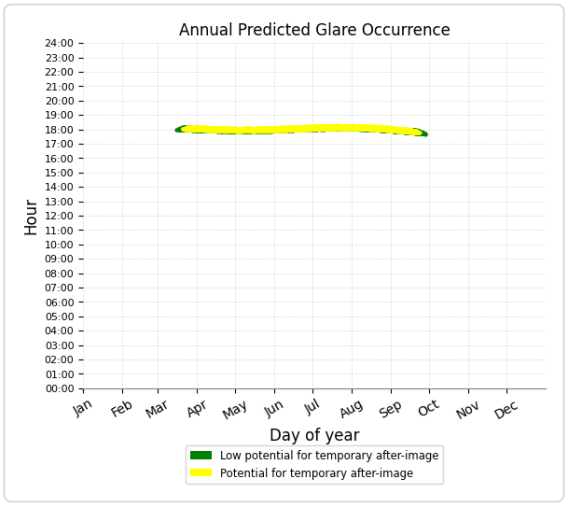


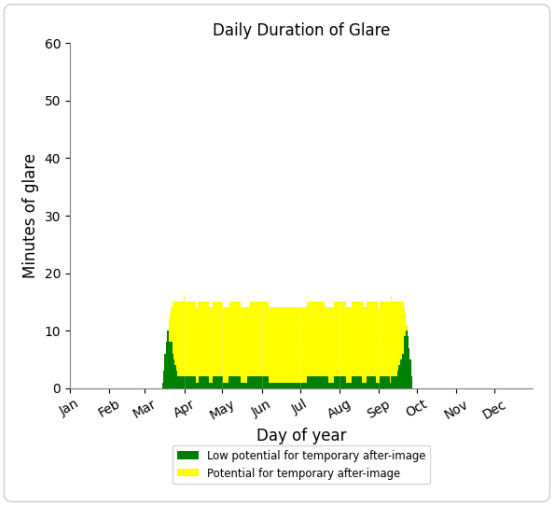


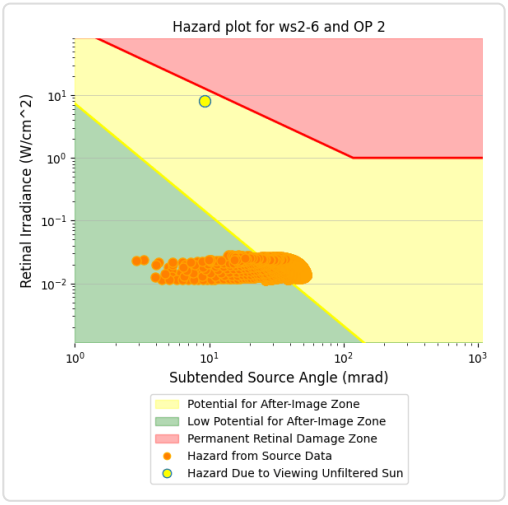
WS2 - 6 and OP 2

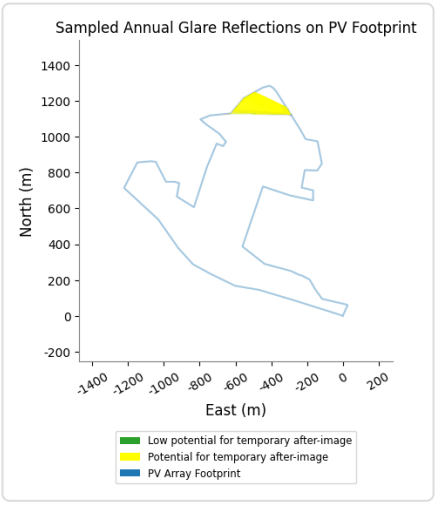
Yellow glare: 2,369 min.

Green glare: 430 min.





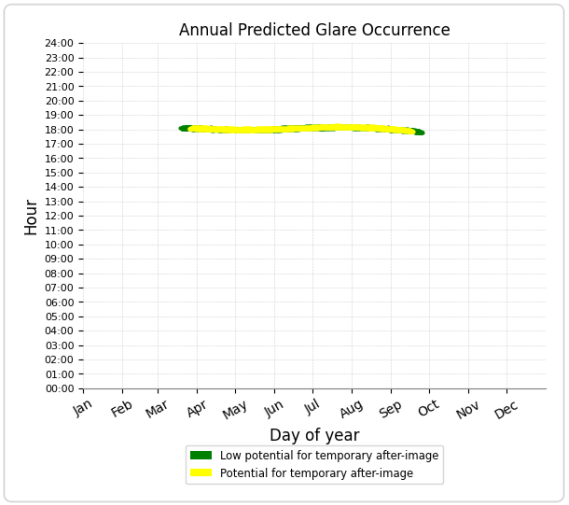


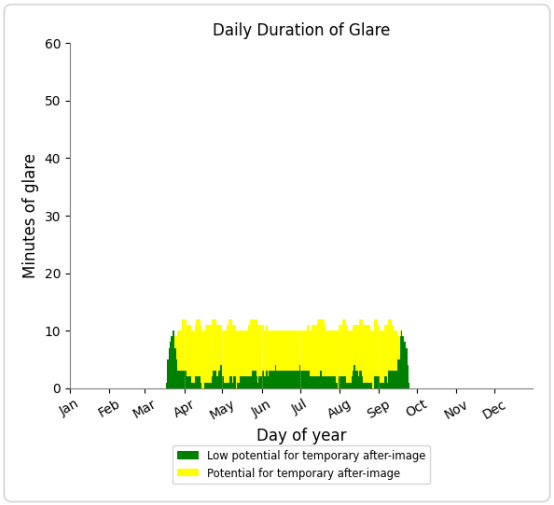


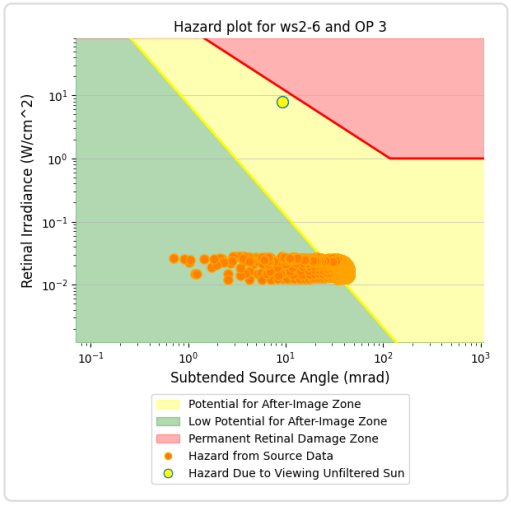
WS2 - 6 and OP 3

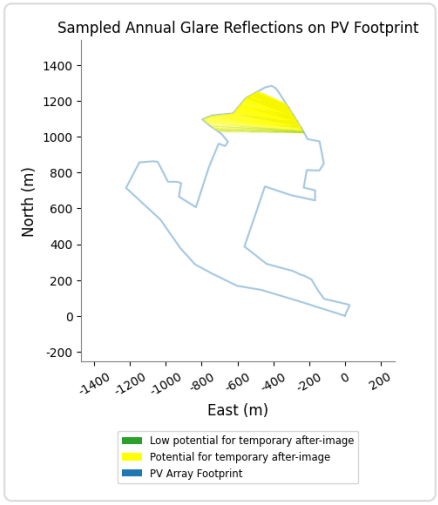
Yellow glare: 1,504 min.

Green glare: 496 min.





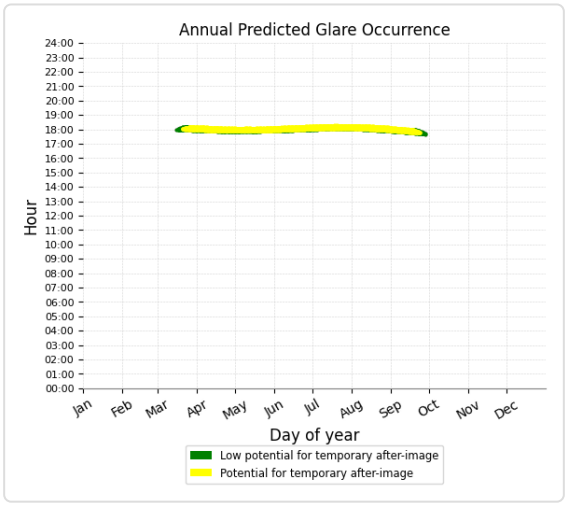


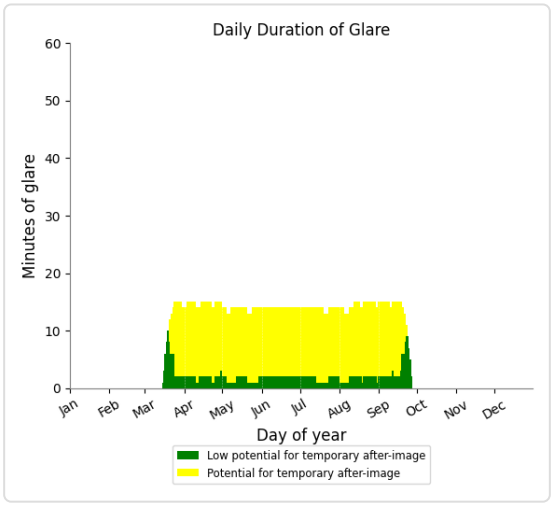


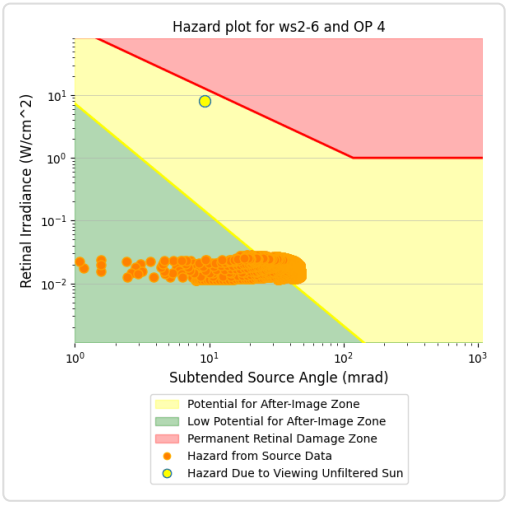
WS2 - 6 and OP 4

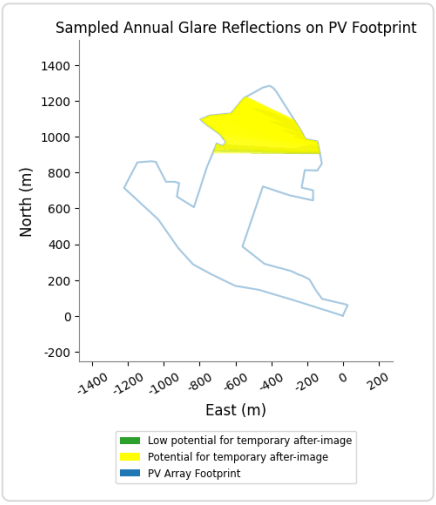
Yellow glare: 2,282 min.

Green glare: 438 min.





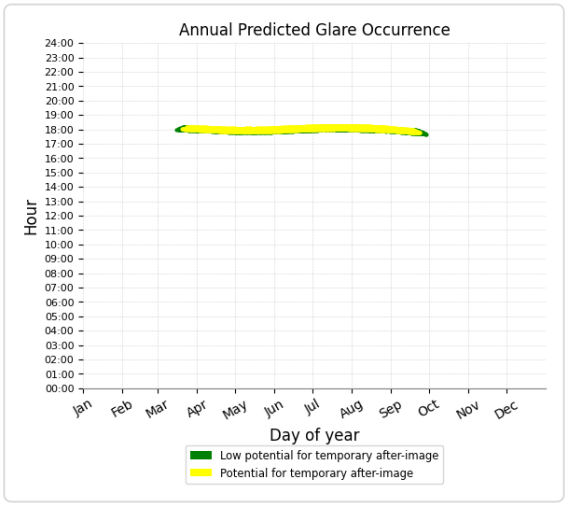


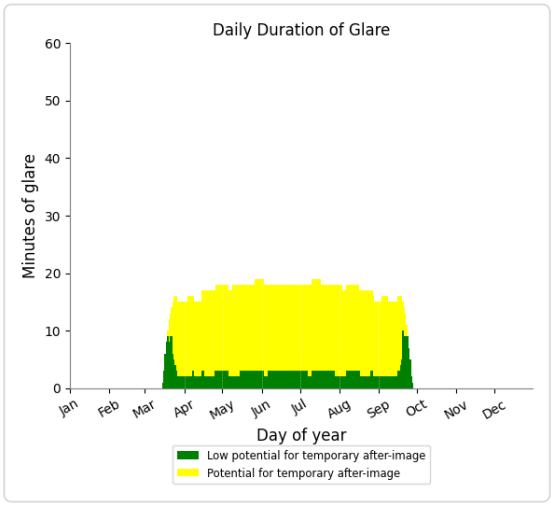


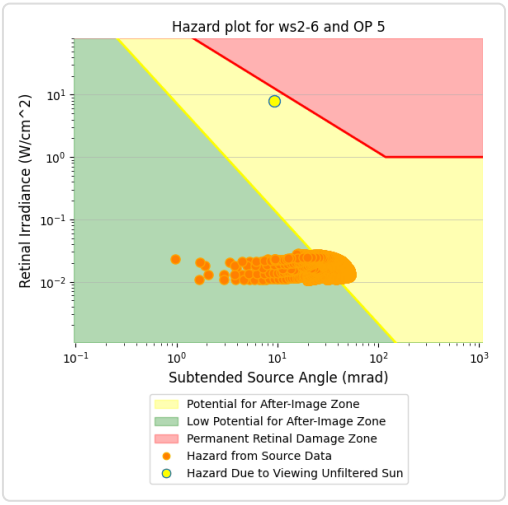
WS2 - 6 and OP 5

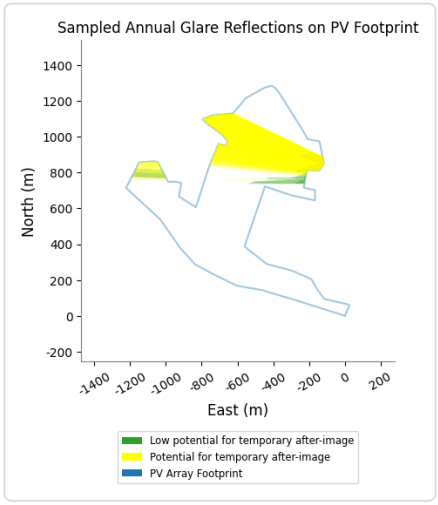
Yellow glare: 2,679 min.

Green glare: 589 min.





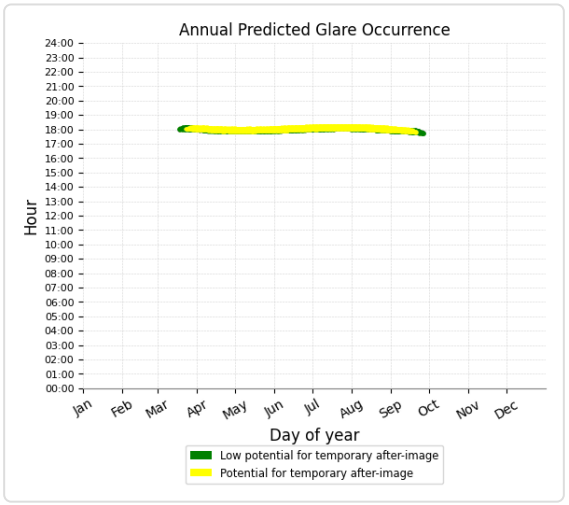


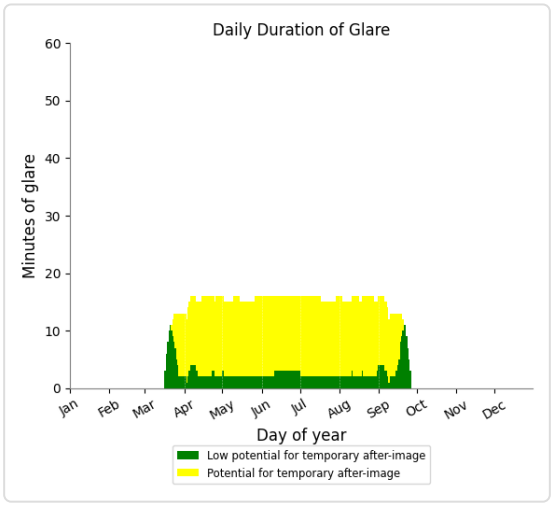


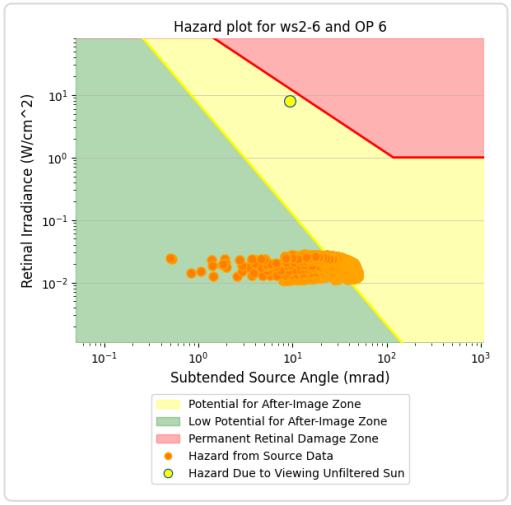
WS2 - 6 and OP 6

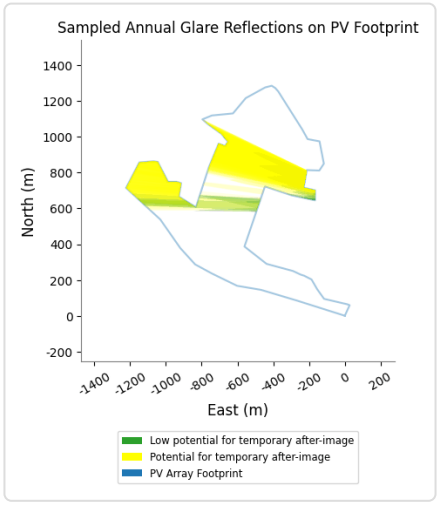
Yellow glare: 2,318 min.

Green glare: 558 min.





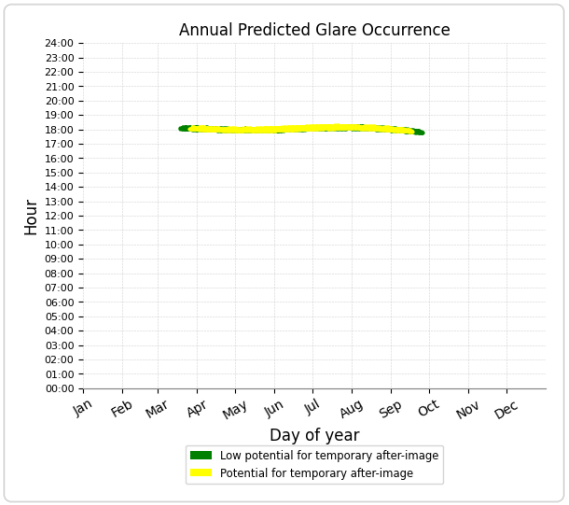


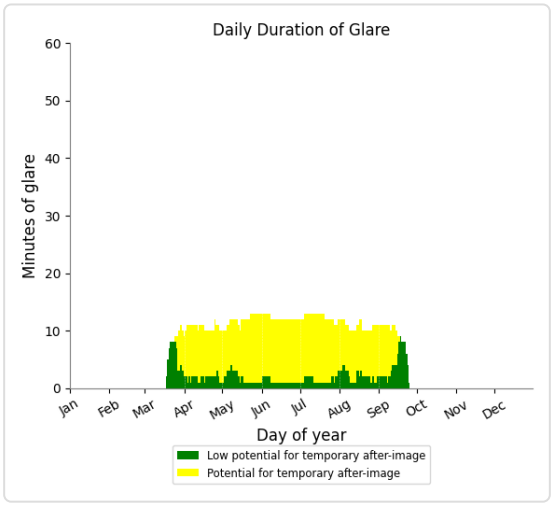


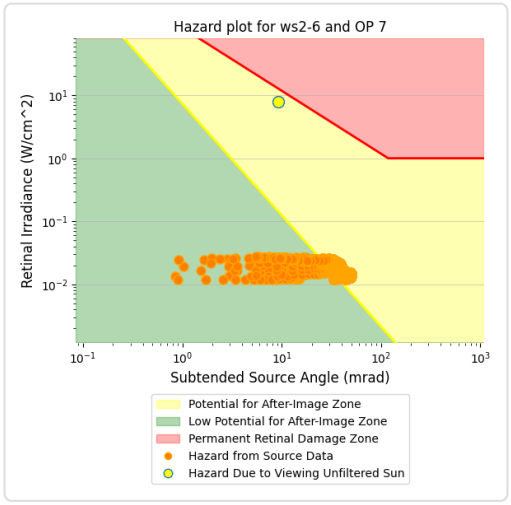
WS2 - 6 and OP 7

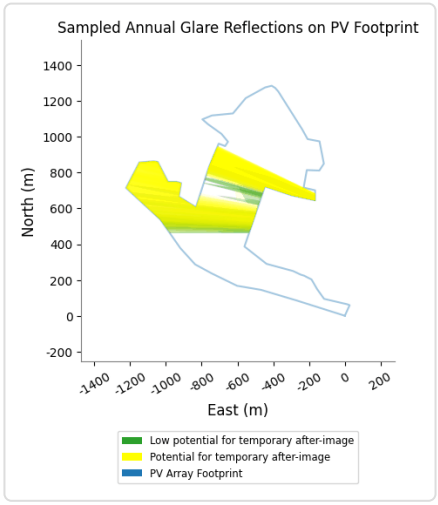
Yellow glare: 1,680 min.

Green glare: 438 min.





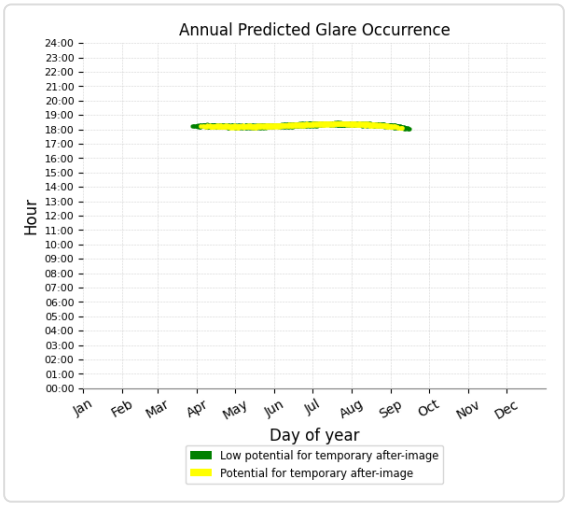


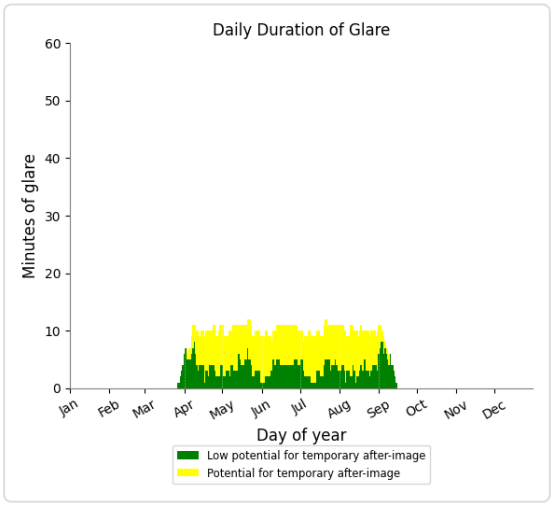


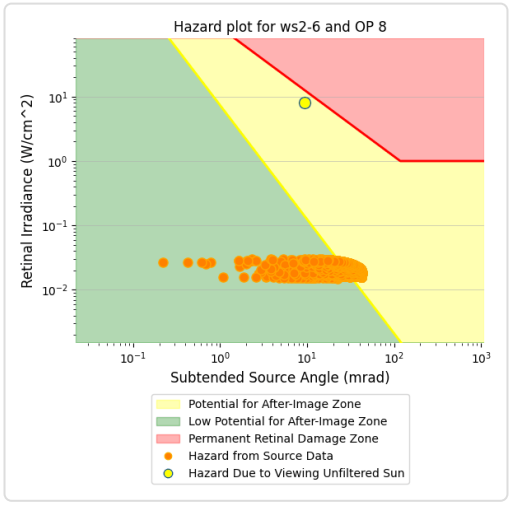
WS2 - 6 and OP 8

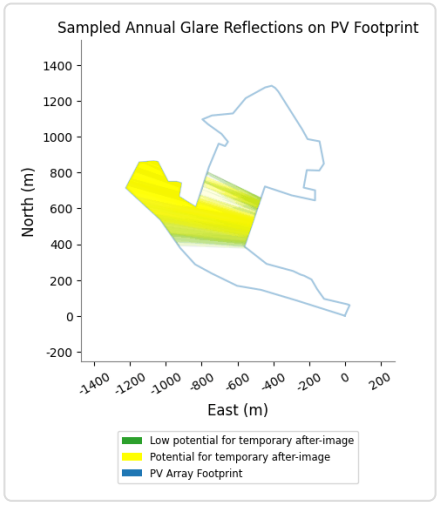
Yellow glare: 1,031 min.

Green glare: 620 min.





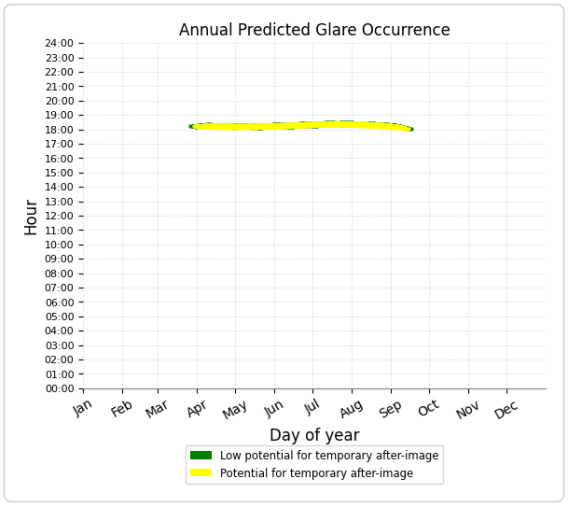


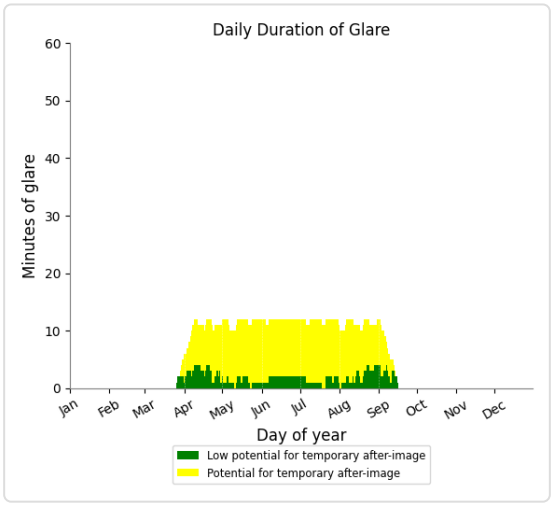


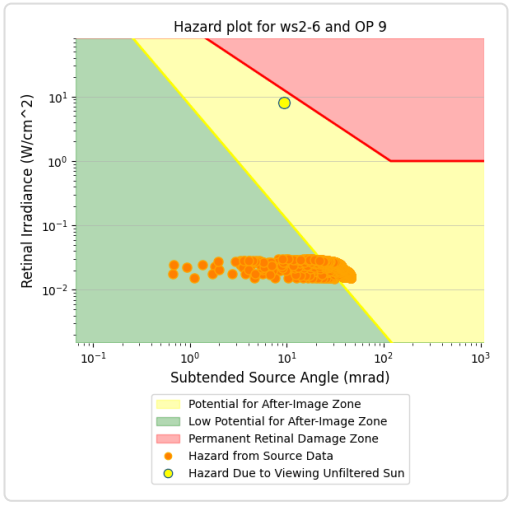
WS2 - 6 and OP 9

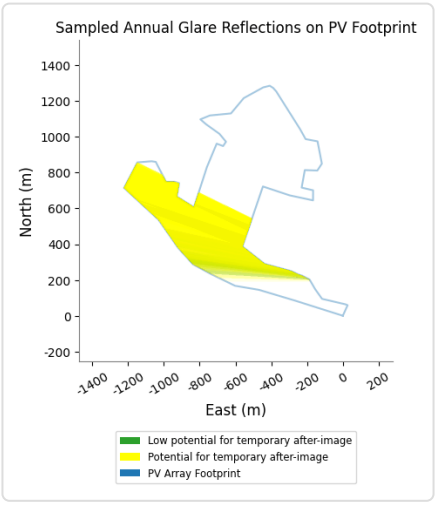
Yellow glare: 1,529 min.

Green glare: 336 min.





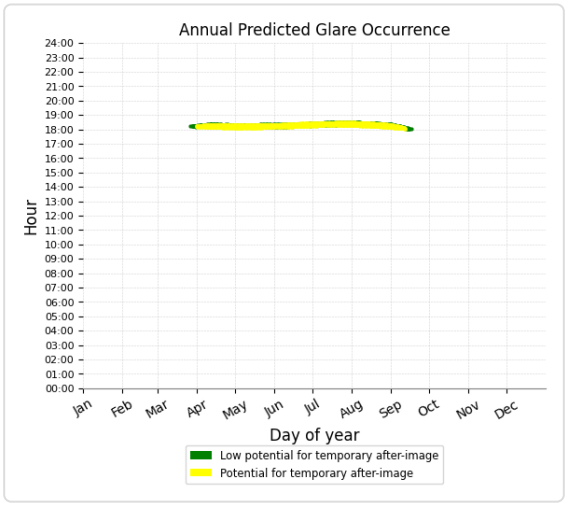


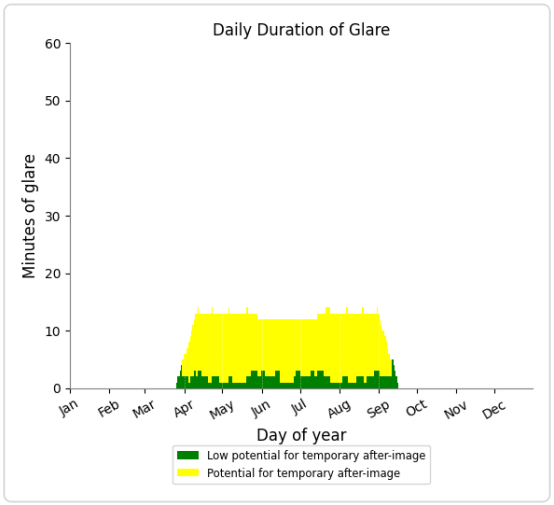


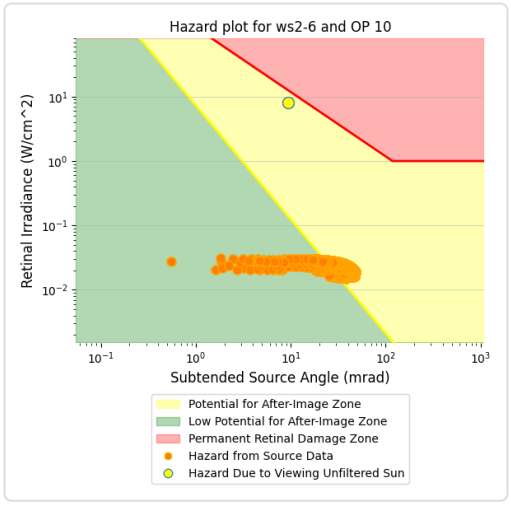
WS2 - 6 and OP 10

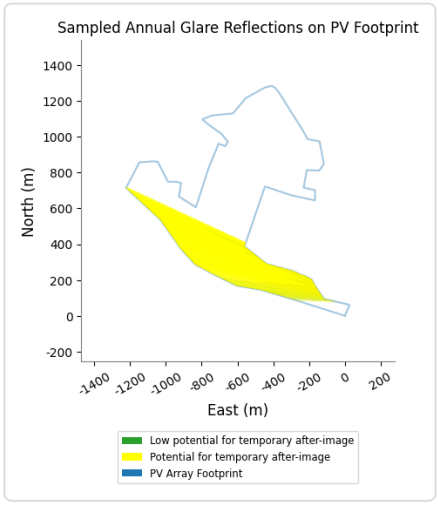
Yellow glare: 1,703 min.

Green glare: 338 min.





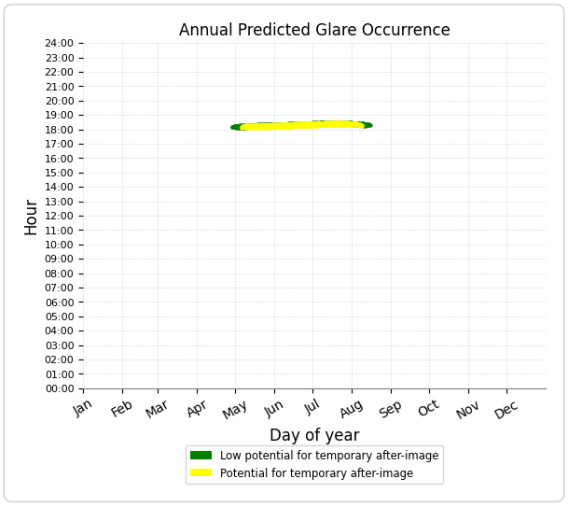


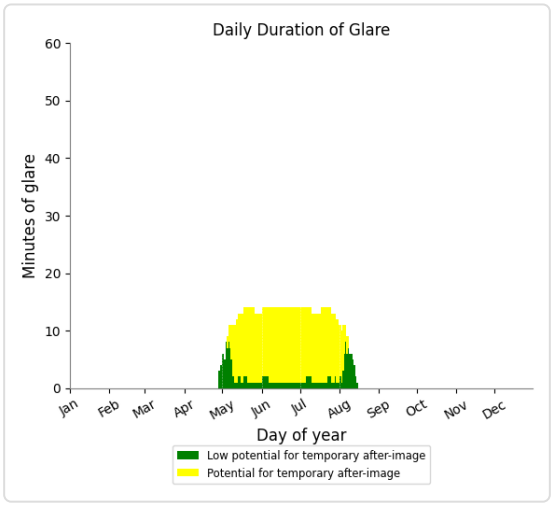


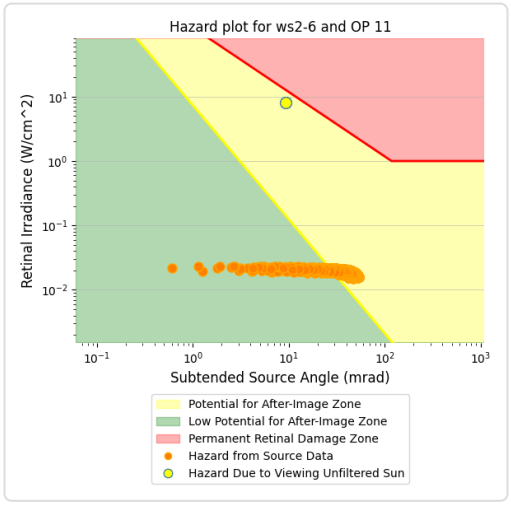
WS2 - 6 and OP 11

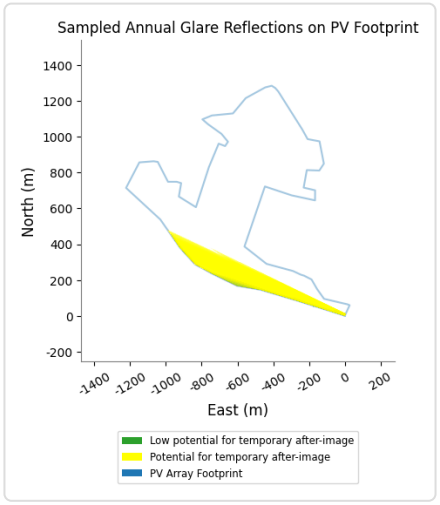
Yellow glare: 1,097 min.

Green glare: 231 min.





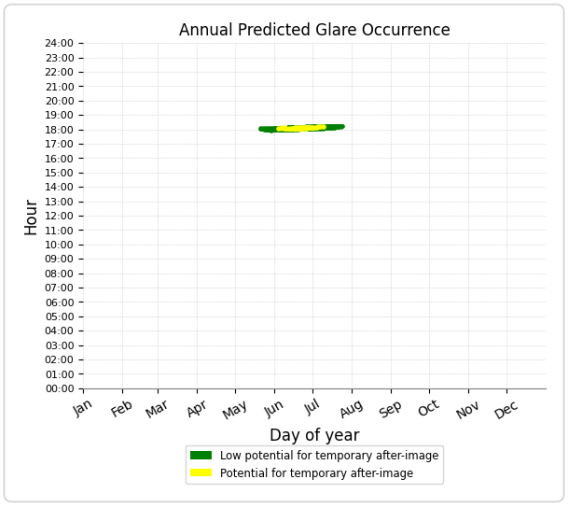


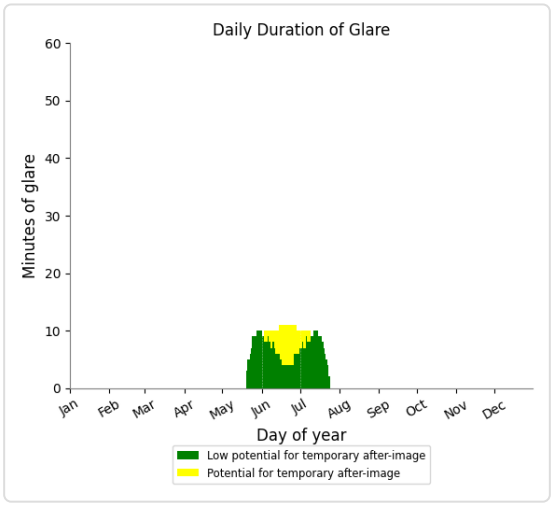


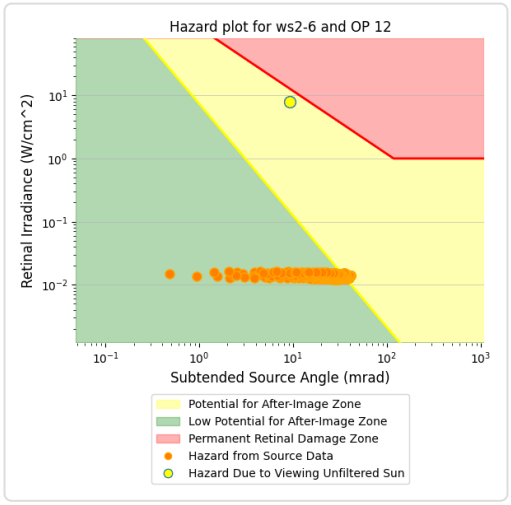
WS2 - 6 and OP 12

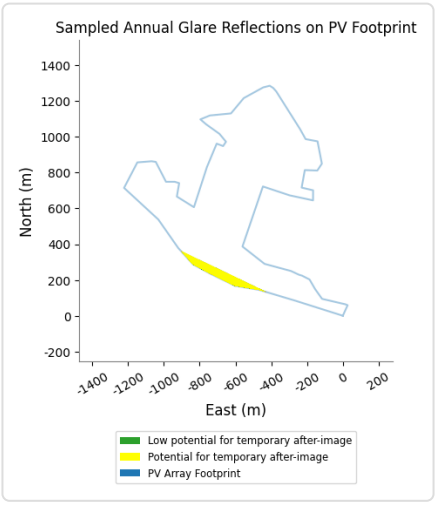
Yellow glare: 152 min.

Green glare: 461 min.





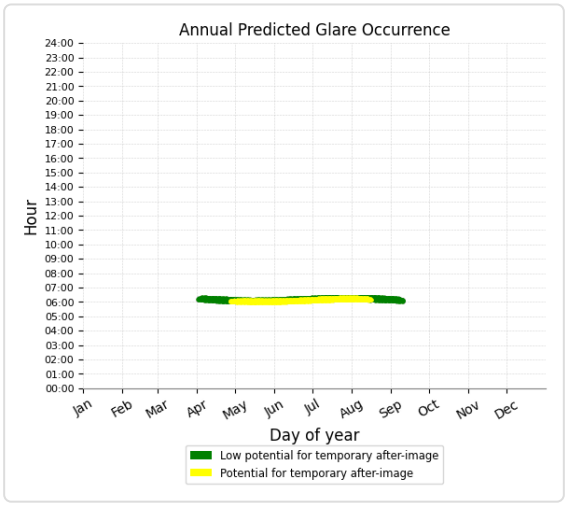


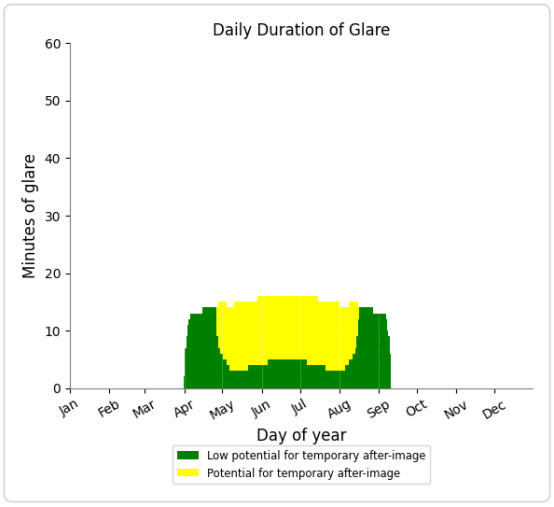


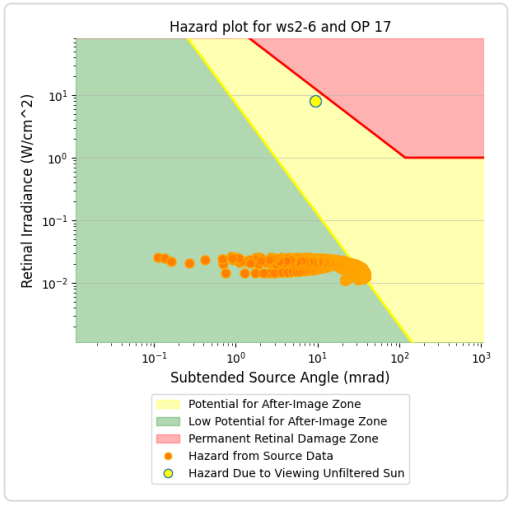
WS2 - 6 and OP 17

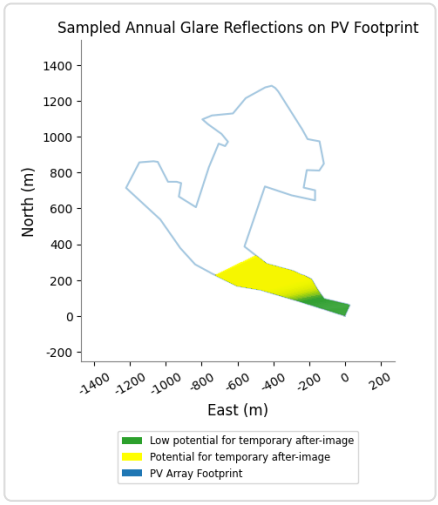
Yellow glare: 1,223 min.

Green glare: 1,136 min.





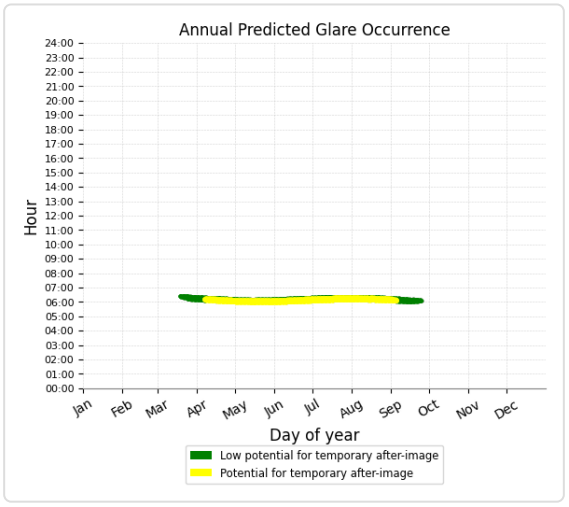


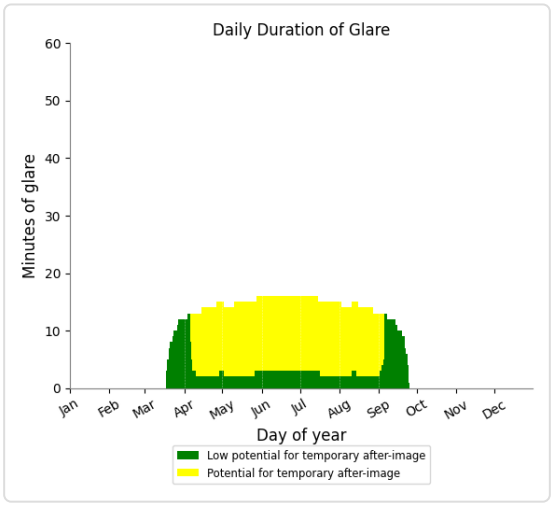


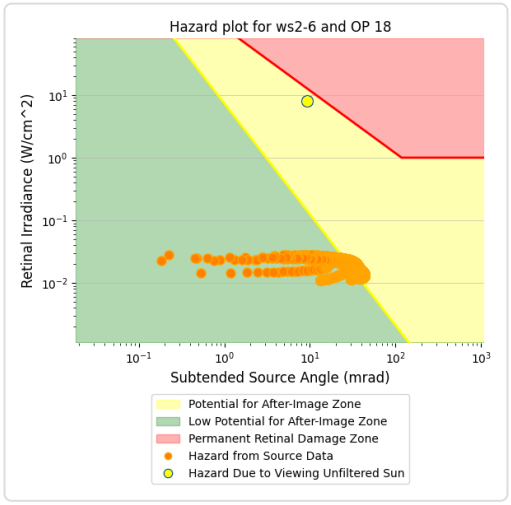
WS2 - 6 and OP 18

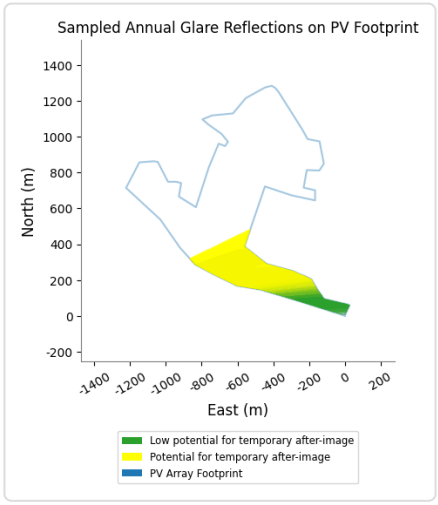
Yellow glare: 1,884 min.

Green glare: 772 min.





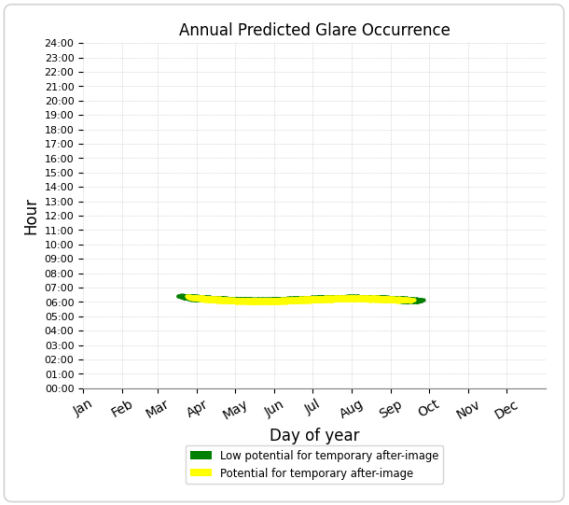


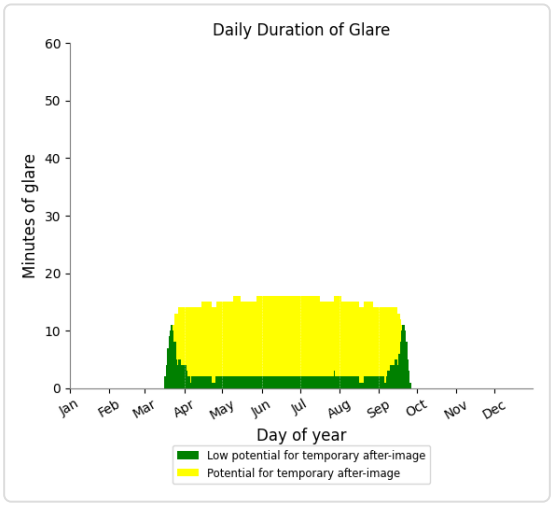


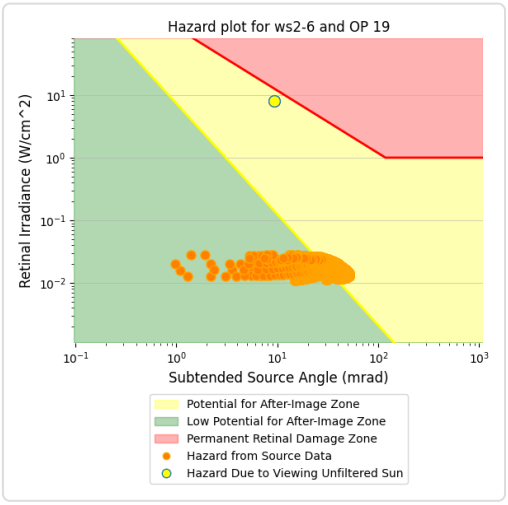
WS2 - 6 and OP 19

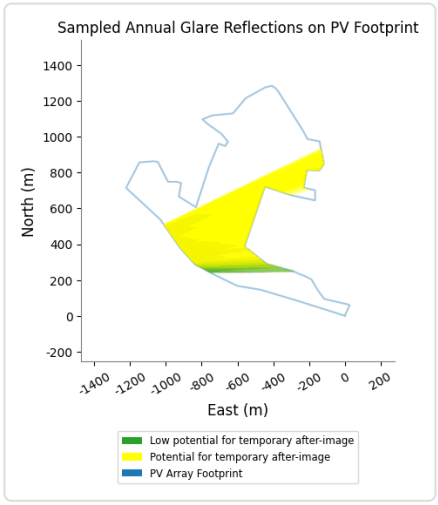
Yellow glare: 2,277 min.

Green glare: 522 min.





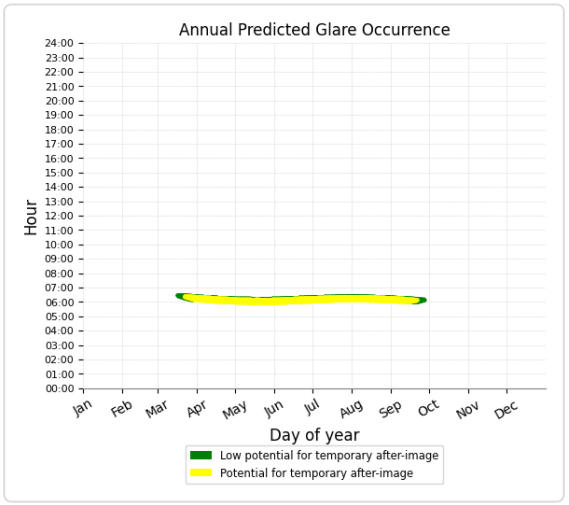


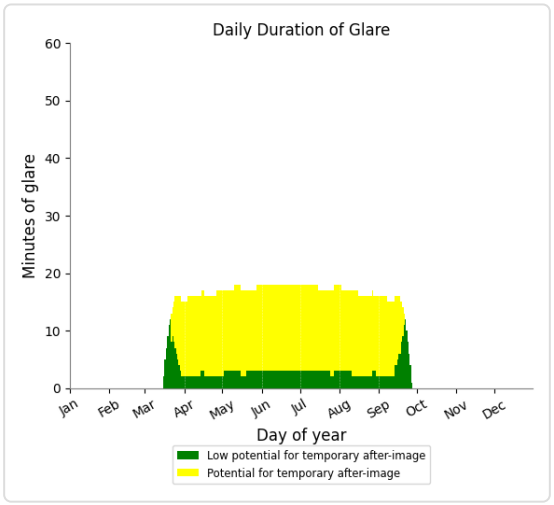


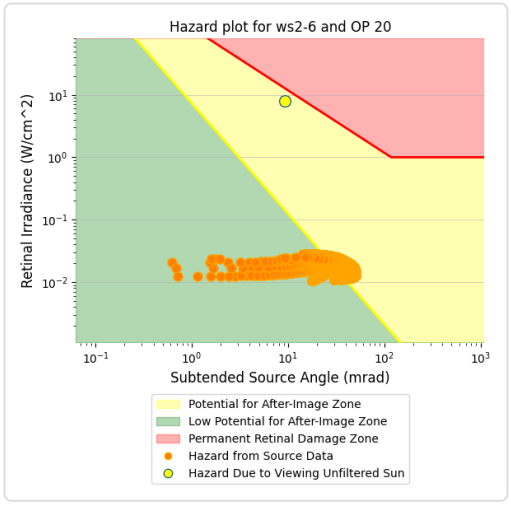
WS2 - 6 and OP 20

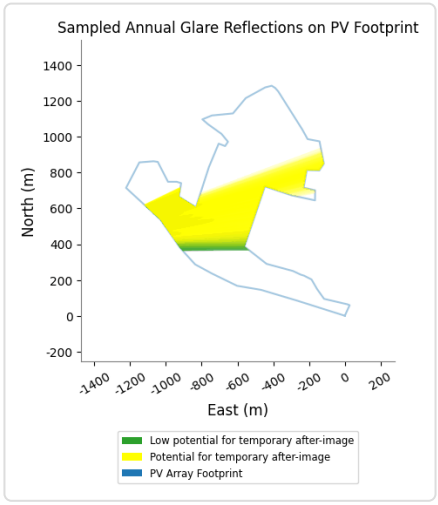
Yellow glare: 2,556 min.

Green glare: 625 min.





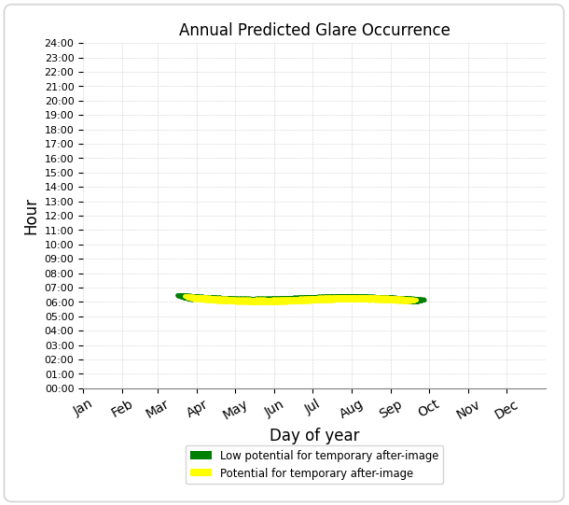


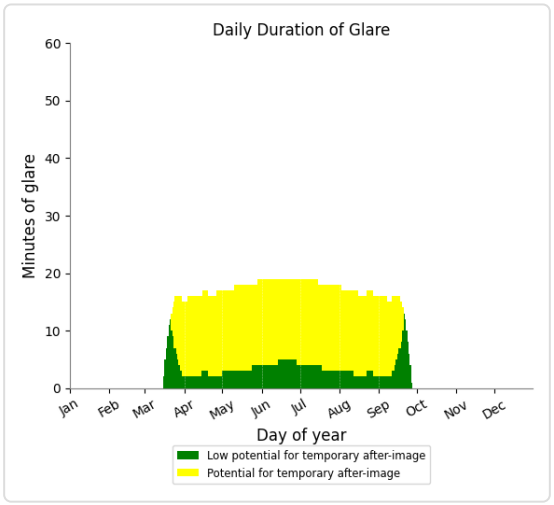


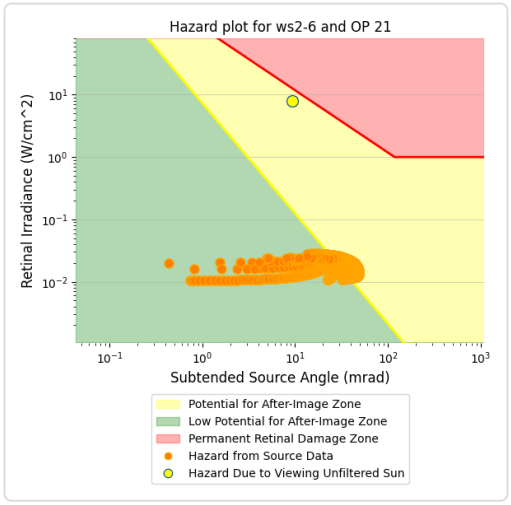
WS2 - 6 and OP 21

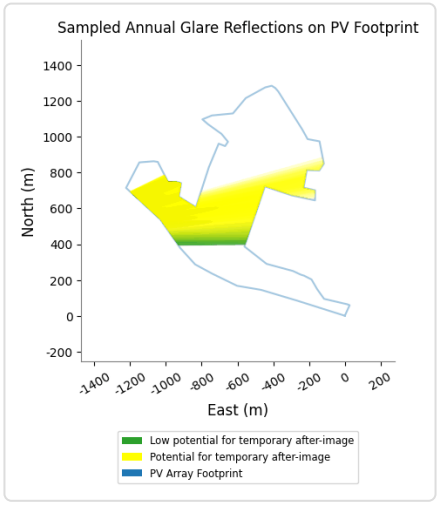
Yellow glare: 2,541 min.

Green glare: 721 min.





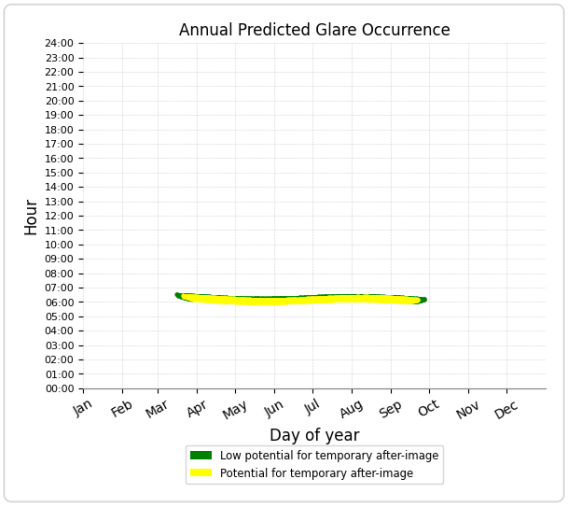


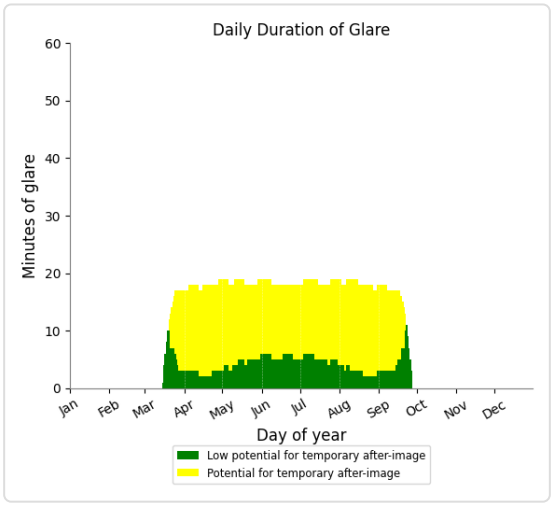


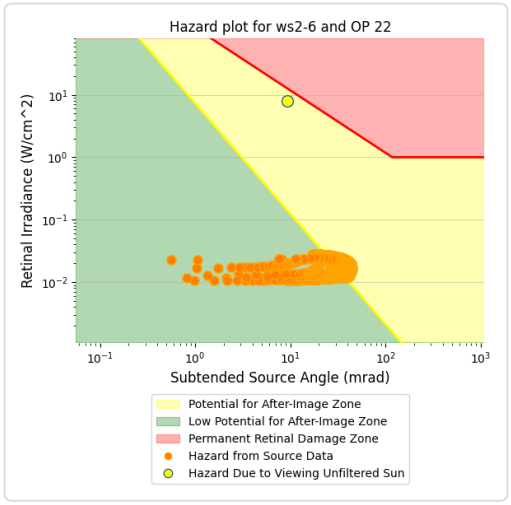
WS2 - 6 and OP 22

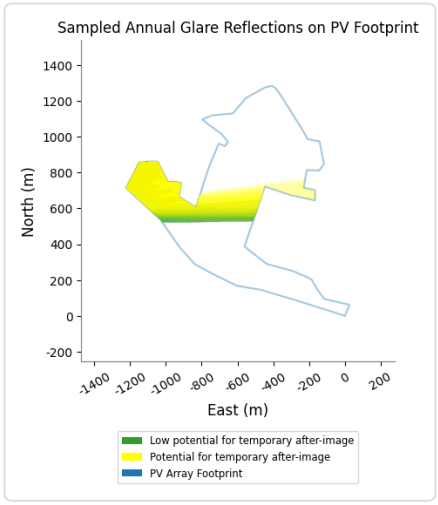
Yellow glare: 2,571 min.

Green glare: 853 min.





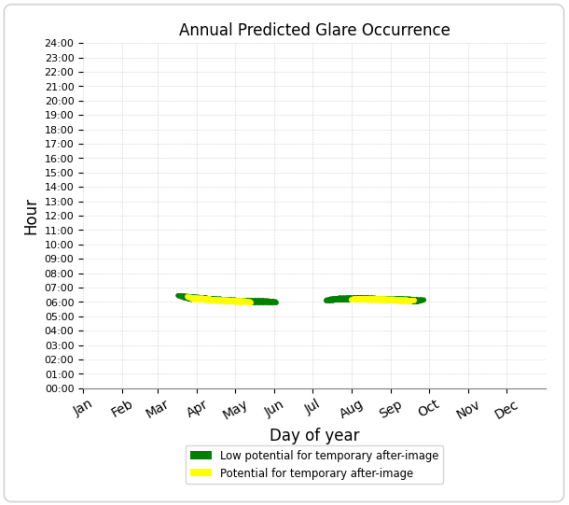


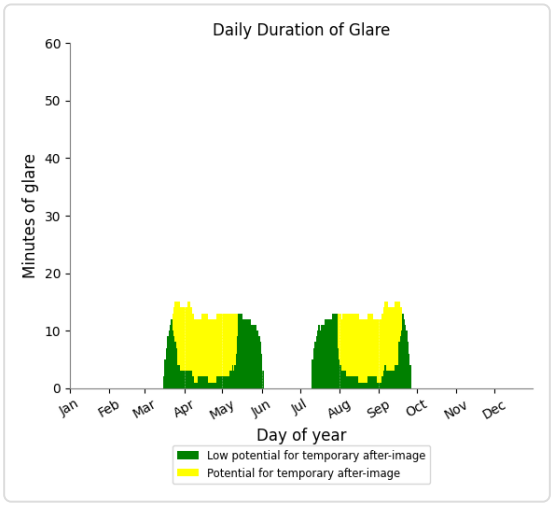


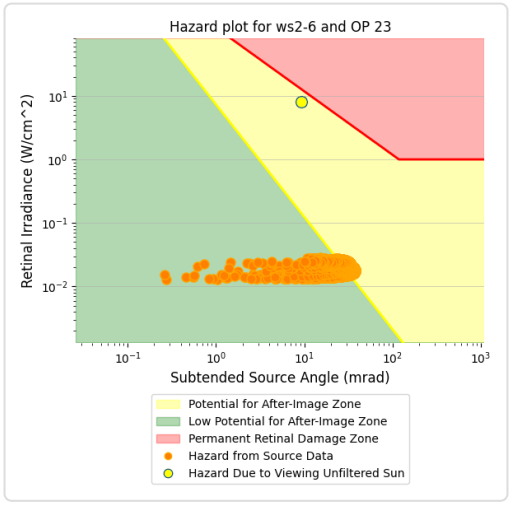
WS2 - 6 and OP 23

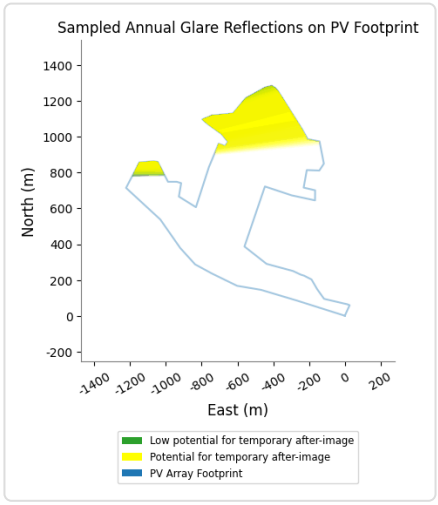
Yellow glare: 1,061 min.

Green glare: 843 min.





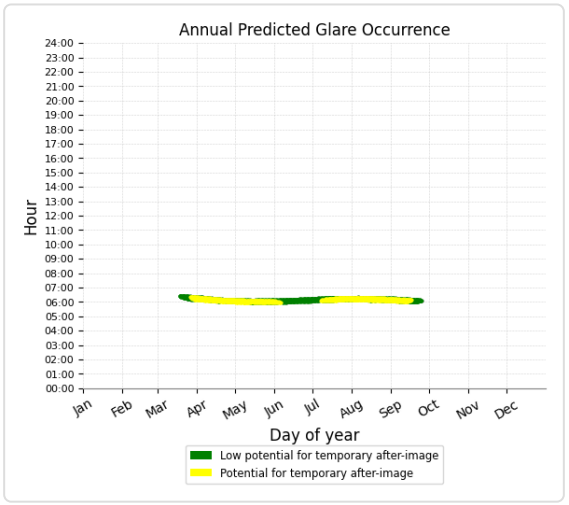


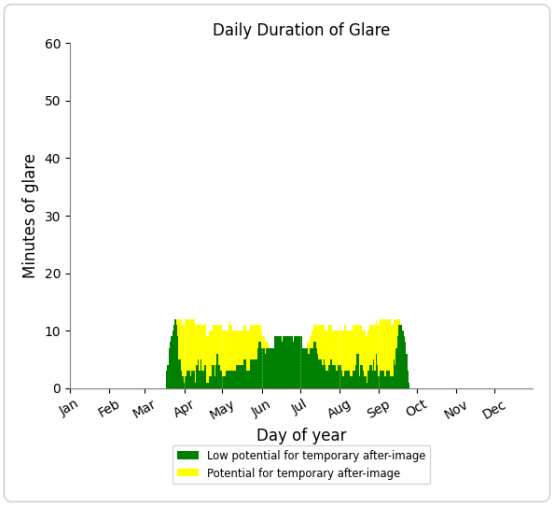


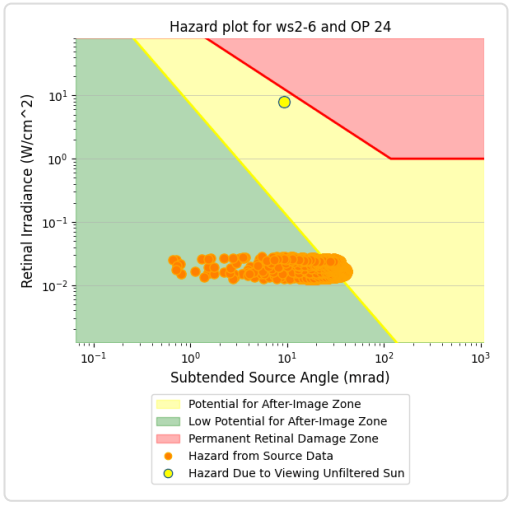
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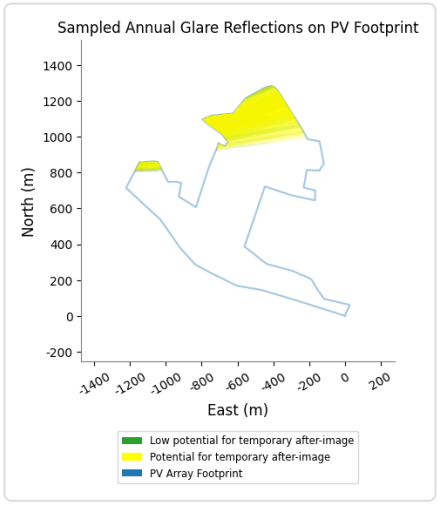
Yellow glare: 966 min.

Green glare: 970 min.





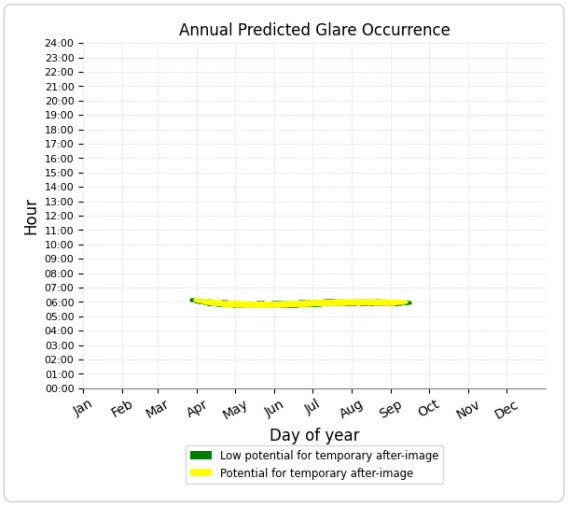


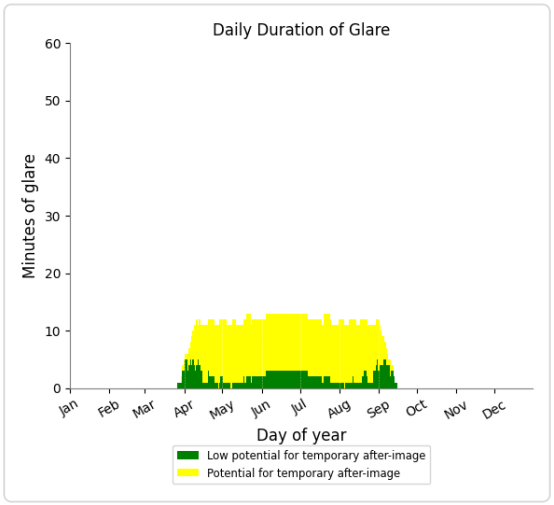


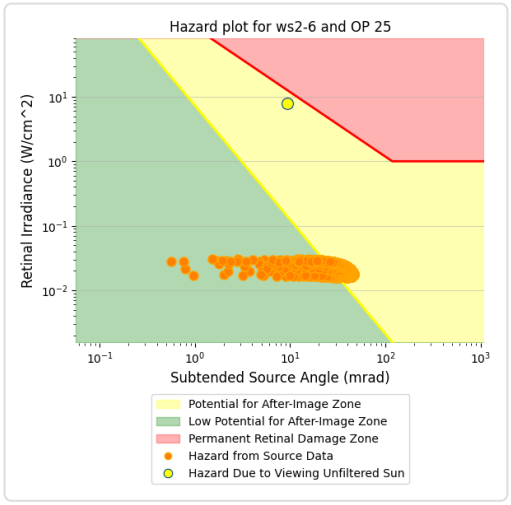
WS2 - 6 and OP 25

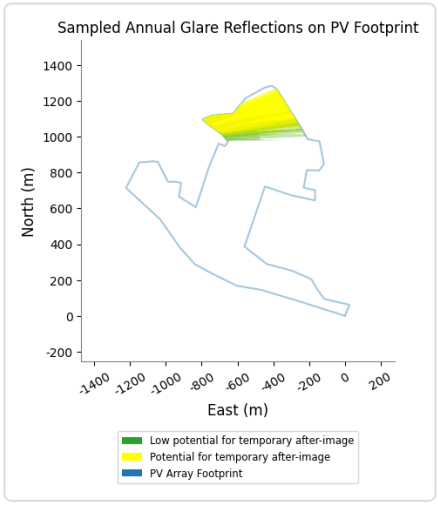
Yellow glare: 1,522 min.

Green glare: 376 min.





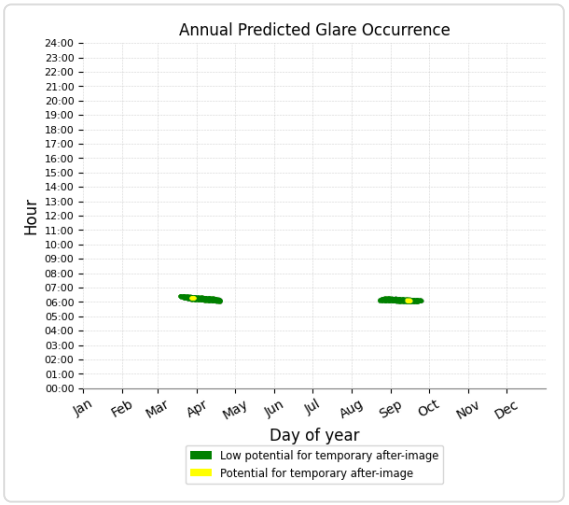


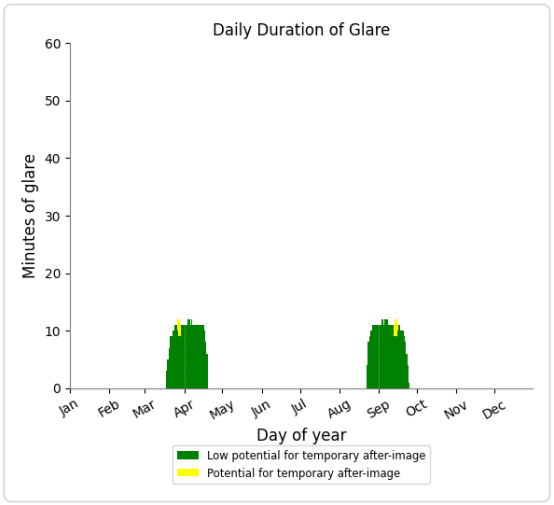


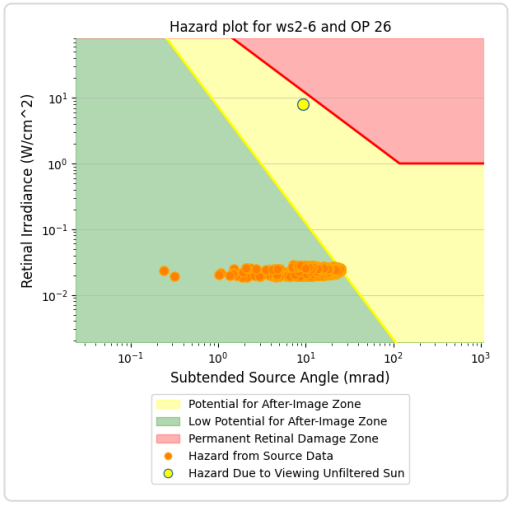
WS2 - 6 and OP 26

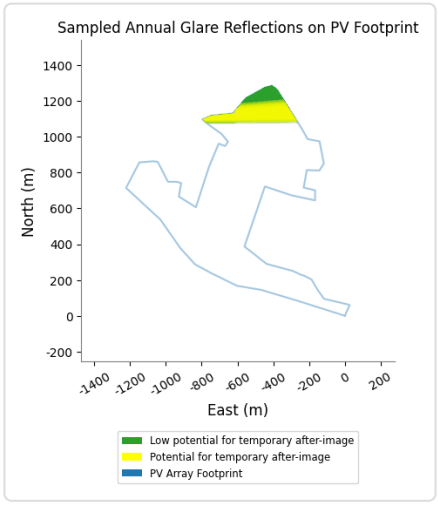
Yellow glare: 16 min.

Green glare: 656 min.









WS2 - 6 and OP 13

No glare found

WS2 - 6 and OP 14

No glare found

WS2 - 6 and OP 15

No glare found

WS2 - 6 and OP 16

No glare found

WS2 - 6 and OP 27

No glare found

WS2 - 6 and OP 28

No glare found

WS2 - 6 and OP 29

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

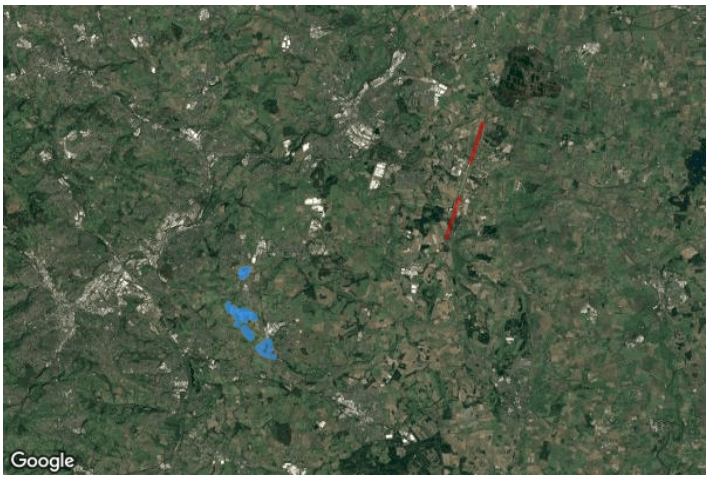
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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **WS2 Doncaster Airport**

Created 27 Nov, 2025
Updated 27 Nov, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 165826.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	0	0.0	0	0.0	-
PV array 10	8.0	180.0	0	0.0	0	0.0	-
PV array 11	8.0	180.0	0	0.0	0	0.0	-
PV Array 2	8.0	180.0	0	0.0	0	0.0	-
PV array 4	8.0	180.0	0	0.0	0	0.0	-
PV array 5	8.0	180.0	0	0.0	0	0.0	-
PV array 6	8.0	180.0	0	0.0	0	0.0	-
PV array 7	8.0	180.0	0	0.0	0	0.0	-
PV array 8	8.0	180.0	0	0.0	0	0.0	-
PV array 9	8.0	180.0	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.364408	-1.255632	96.70	3.80	100.50
2	53.365676	-1.252886	97.50	3.80	101.30
3	53.368928	-1.254109	95.20	3.80	99.00
4	53.369696	-1.256877	95.80	3.80	99.60
5	53.371653	-1.259216	97.40	3.80	101.20
6	53.373475	-1.261726	98.90	3.80	102.70
7	53.372246	-1.265202	105.30	3.80	109.10
8	53.370953	-1.262928	102.00	3.80	105.80
9	53.369788	-1.263829	99.40	3.80	103.20
10	53.369161	-1.262778	98.40	3.80	102.20
11	53.369583	-1.261984	99.90	3.80	103.70
12	53.368751	-1.260568	97.90	3.80	101.70
13	53.368186	-1.261876	97.80	3.80	101.60

Name: PV array 10
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



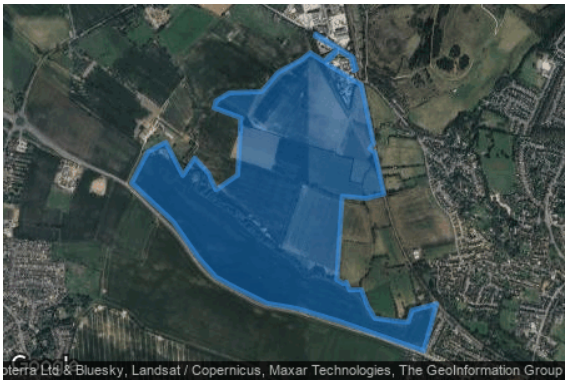
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.410383	-1.267270	112.54	3.80	116.34
2	53.407601	-1.266519	126.37	3.80	130.17
3	53.407665	-1.265940	127.34	3.80	131.14
4	53.407473	-1.265049	127.46	3.80	131.26
5	53.407179	-1.264910	127.80	3.80	131.60
6	53.407454	-1.263011	126.01	3.80	129.81
7	53.408394	-1.262592	121.71	3.80	125.51
8	53.409507	-1.259213	108.80	3.80	112.60
9	53.410569	-1.258783	105.35	3.80	109.15
10	53.410825	-1.259438	105.63	3.80	109.43
11	53.410140	-1.260157	108.59	3.80	112.39
12	53.410626	-1.263654	109.07	3.80	112.87

Name: PV array 11
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.374099	-1.272970	117.32	3.80	121.12
2	53.374266	-1.270481	113.86	3.80	117.66
3	53.374093	-1.269837	112.01	3.80	115.81
4	53.374534	-1.269805	113.32	3.80	117.12
5	53.375462	-1.268883	108.61	3.80	112.41
6	53.376647	-1.266769	99.76	3.80	103.56
7	53.377613	-1.268893	102.21	3.80	106.01
8	53.378067	-1.268003	104.87	3.80	108.67
9	53.379026	-1.267112	104.54	3.80	108.34
10	53.379851	-1.265610	108.03	3.80	111.83
11	53.381644	-1.267863	109.90	3.80	113.70
12	53.382597	-1.268851	110.61	3.80	114.41
13	53.383935	-1.270718	113.30	3.80	117.10
14	53.382805	-1.272376	110.71	3.80	114.51
15	53.380614	-1.274344	107.46	3.80	111.26
16	53.379100	-1.272220	105.96	3.80	109.76
17	53.377788	-1.269633	102.75	3.80	106.55
18	53.376462	-1.271103	110.48	3.80	114.28
19	53.375057	-1.272441	116.64	3.80	120.44

Name: PV Array 2
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.351301	-1.228110	98.60	3.80	102.40
2	53.352505	-1.233861	94.50	3.80	98.30
3	53.353043	-1.236865	95.30	3.80	99.10
4	53.353248	-1.238882	95.00	3.80	98.80
5	53.353863	-1.240985	94.40	3.80	98.20
6	53.354324	-1.242401	94.20	3.80	98.00
7	53.355143	-1.243645	96.90	3.80	100.70
8	53.356578	-1.245319	96.60	3.80	100.40
9	53.358166	-1.248194	95.70	3.80	99.50
10	53.359446	-1.247079	93.00	3.80	96.80
11	53.359830	-1.245834	91.40	3.80	95.20
12	53.359472	-1.245534	91.40	3.80	95.20
13	53.358473	-1.244675	94.60	3.80	98.40
14	53.359190	-1.243860	92.80	3.80	96.60
15	53.358575	-1.242916	93.00	3.80	96.80
16	53.357884	-1.242401	92.50	3.80	96.30
17	53.358499	-1.240899	95.20	3.80	99.00
18	53.360829	-1.240684	94.30	3.80	98.10
19	53.361239	-1.242530	91.00	3.80	94.80
20	53.361521	-1.242401	91.20	3.80	95.00
21	53.361854	-1.241457	91.60	3.80	95.40
22	53.361905	-1.239225	94.50	3.80	98.30
23	53.362673	-1.238152	94.00	3.80	97.80
24	53.363211	-1.236521	95.50	3.80	99.30
25	53.363493	-1.235921	96.50	3.80	100.30
26	53.363134	-1.234977	97.70	3.80	101.50
27	53.363595	-1.234161	98.40	3.80	102.20
28	53.363671	-1.234108	98.50	3.80	102.30
29	53.364184	-1.235588	98.00	3.80	101.80
30	53.364254	-1.235513	98.00	3.80	101.80
31	53.363313	-1.232981	99.00	3.80	102.80
32	53.362813	-1.232745	99.00	3.80	102.80
33	53.362762	-1.232927	99.00	3.80	102.80
34	53.363294	-1.233110	99.00	3.80	102.80
35	53.363595	-1.233968	98.40	3.80	102.20
36	53.363063	-1.234816	98.10	3.80	101.90
37	53.362173	-1.232391	99.60	3.80	103.40
38	53.359779	-1.231554	96.40	3.80	100.20
39	53.359574	-1.231833	96.00	3.80	99.80
40	53.359420	-1.231468	96.50	3.80	100.30
41	53.357717	-1.230846	97.40	3.80	101.20
42	53.357538	-1.232069	96.00	3.80	99.80
43	53.357627	-1.233721	96.50	3.80	100.30
44	53.354208	-1.234086	93.30	3.80	97.10
45	53.354054	-1.233636	92.60	3.80	96.40
46	53.354118	-1.233442	92.30	3.80	96.10
47	53.353798	-1.233206	92.00	3.80	95.80
48	53.353798	-1.232391	92.00	3.80	95.80
49	53.353132	-1.231962	92.10	3.80	95.90
50	53.352632	-1.231468	93.40	3.80	97.20
51	53.352492	-1.229537	94.80	3.80	98.60
52	53.352492	-1.229172	94.80	3.80	98.60
53	53.352965	-1.228936	93.90	3.80	97.70
54	53.353234	-1.227220	94.00	3.80	97.80

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382537	-1.268075	110.00	3.80	113.80
2	53.383868	-1.269835	112.10	3.80	115.90
3	53.383753	-1.268998	111.50	3.80	115.30
4	53.384745	-1.269331	118.00	3.80	121.80
5	53.385205	-1.264202	109.60	3.80	113.40
6	53.384572	-1.264106	108.90	3.80	112.70
7	53.384898	-1.259394	106.60	3.80	110.40
8	53.383561	-1.259029	105.10	3.80	108.90
9	53.382793	-1.258965	104.70	3.80	108.50
10	53.382251	-1.262063	105.50	3.80	109.30

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382020	-1.265825	108.40	3.80	112.20
2	53.380253	-1.263379	109.40	3.80	113.20
3	53.379660	-1.264794	105.80	3.80	109.60
4	53.376873	-1.261473	99.90	3.80	103.70
5	53.378812	-1.258855	102.90	3.80	106.70
6	53.379353	-1.258866	106.10	3.80	109.90
7	53.379231	-1.257761	106.00	3.80	109.80
8	53.379455	-1.256495	102.90	3.80	106.70
9	53.382220	-1.255343	100.00	3.80	103.80
10	53.382412	-1.258540	104.00	3.80	107.80
11	53.381913	-1.261587	107.30	3.80	111.10

Name: PV array 6
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382270	-1.254613	100.50	3.80	104.30
2	53.380427	-1.254141	98.90	3.80	102.70
3	53.378392	-1.252252	98.30	3.80	102.10
4	53.378648	-1.248969	99.80	3.80	103.60
5	53.380708	-1.249828	103.10	3.80	106.90
6	53.380427	-1.252145	100.70	3.80	104.50
7	53.382731	-1.253304	103.90	3.80	107.70

Name: PV array 7
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.386452	-1.273855	113.47	3.80	117.27
2	53.386094	-1.273190	114.86	3.80	118.66
3	53.385172	-1.275250	117.69	3.80	121.49
4	53.383803	-1.275850	112.85	3.80	116.65
5	53.383278	-1.277009	112.89	3.80	116.69
6	53.383368	-1.277267	113.27	3.80	117.07
7	53.385505	-1.277138	115.86	3.80	119.66
8	53.387111	-1.276322	110.56	0.00	110.56
9	53.386427	-1.274971	114.74	3.80	118.54

Name: PV array 8
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.383496	-1.279305	110.60	3.80	114.40
2	53.385288	-1.279198	116.00	3.80	119.80
3	53.387694	-1.280249	113.50	3.80	117.30
4	53.390010	-1.281537	102.80	3.80	106.60
5	53.387425	-1.283275	111.50	3.80	115.30
6	53.384725	-1.281344	109.50	3.80	113.30
7	53.384341	-1.281558	107.90	3.80	111.70
8	53.383521	-1.280292	106.90	3.80	110.70

Name: PV array 9
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414203	-1.256784	117.74	3.80	121.54
2	53.412514	-1.257525	110.33	3.80	114.13
3	53.412591	-1.261838	109.98	3.80	113.78
4	53.412949	-1.262996	111.29	3.80	115.09
5	53.412975	-1.264005	112.22	3.80	116.02
6	53.412009	-1.263619	107.45	3.80	111.25
7	53.411082	-1.264852	108.34	3.80	112.14
8	53.410960	-1.267932	111.07	3.80	114.87
9	53.411843	-1.267937	113.38	3.80	117.18
10	53.411958	-1.264702	111.92	3.80	115.72
11	53.413189	-1.265405	117.88	3.80	121.68
12	53.413682	-1.265721	119.28	3.80	123.08
13	53.414251	-1.256795	117.76	3.80	121.56

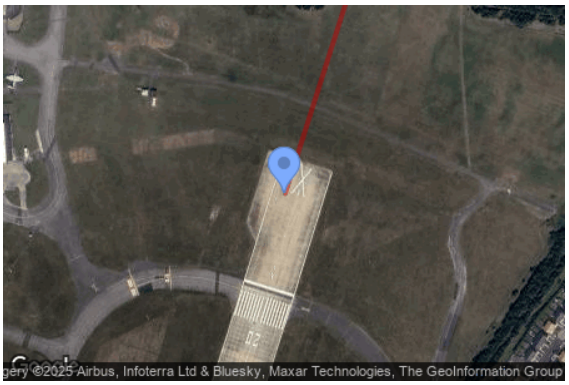
Flight Path Receptors

Name: 02
Description: None
Threshold height: 52 m
Direction: 17.7°
Glide slope: 3.1°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.463085	-1.010804	19.50	52.00	71.50
Two-mile	53.435541	-1.025586	23.80	222.00	245.80

Name: 20
Description: None
Threshold height: 26 m
Direction: 197.7°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.487357	-0.997922	7.70	26.00	33.70
Two-mile	53.514901	-0.983131	3.00	199.40	202.40

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	0	0.0	0	0.0	-
PV array 10	8.0	180.0	0	0.0	0	0.0	-
PV array 11	8.0	180.0	0	0.0	0	0.0	-
PV Array 2	8.0	180.0	0	0.0	0	0.0	-
PV array 4	8.0	180.0	0	0.0	0	0.0	-
PV array 5	8.0	180.0	0	0.0	0	0.0	-
PV array 6	8.0	180.0	0	0.0	0	0.0	-
PV array 7	8.0	180.0	0	0.0	0	0.0	-
PV array 8	8.0	180.0	0	0.0	0	0.0	-
PV array 9	8.0	180.0	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV: PV array 1 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 1 and FP: 02

No glare found

PV array 1 and FP: 20

No glare found

PV: PV array 10 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 10 and FP: 02

No glare found

PV array 10 and FP: 20

No glare found

PV: PV array 11 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 11 and FP: 02

No glare found

PV array 11 and FP: 20

No glare found

PV: PV Array 2 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV Array 2 and FP: 02

No glare found

PV Array 2 and FP: 20

No glare found

PV: PV array 4 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 4 and FP: 02

No glare found

PV array 4 and FP: 20

No glare found

PV: PV array 5 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 5 and FP: 02

No glare found

PV array 5 and FP: 20

No glare found

PV: PV array 6 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 6 and FP: 02

No glare found

PV array 6 and FP: 20

No glare found

PV: PV array 7 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 7 and FP: 02

No glare found

PV array 7 and FP: 20

No glare found

PV: PV array 8 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 8 and FP: 02

No glare found

PV array 8 and FP: 20

No glare found

PV: PV array 9 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 9 and FP: 02

No glare found

PV array 9 and FP: 20

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

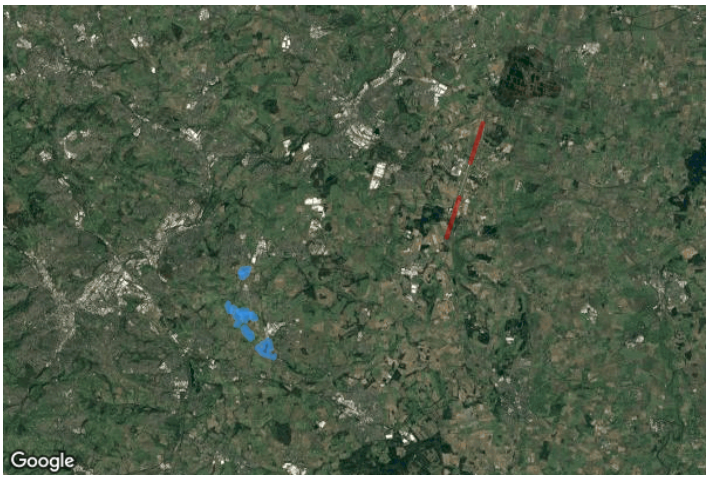
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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 2**
Site configuration: **WS2 Doncaster Airport**

Created 27 Nov, 2025
Updated 27 Nov, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 165826.25551

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	0	0.0	0	0.0	-
PV array 10	25.0	180.0	0	0.0	0	0.0	-
PV array 11	25.0	180.0	0	0.0	0	0.0	-
PV Array 2	25.0	180.0	0	0.0	0	0.0	-
PV array 4	25.0	180.0	0	0.0	0	0.0	-
PV array 5	25.0	180.0	0	0.0	0	0.0	-
PV array 6	25.0	180.0	0	0.0	0	0.0	-
PV array 7	25.0	180.0	0	0.0	0	0.0	-
PV array 8	25.0	180.0	0	0.0	0	0.0	-
PV array 9	25.0	180.0	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.364408	-1.255632	96.70	3.80	100.50
2	53.365676	-1.252886	97.50	3.80	101.30
3	53.368928	-1.254109	95.20	3.80	99.00
4	53.369696	-1.256877	95.80	3.80	99.60
5	53.371653	-1.259216	97.40	3.80	101.20
6	53.373475	-1.261726	98.90	3.80	102.70
7	53.372246	-1.265202	105.30	3.80	109.10
8	53.370953	-1.262928	102.00	3.80	105.80
9	53.369788	-1.263829	99.40	3.80	103.20
10	53.369161	-1.262778	98.40	3.80	102.20
11	53.369583	-1.261984	99.90	3.80	103.70
12	53.368751	-1.260568	97.90	3.80	101.70
13	53.368186	-1.261876	97.80	3.80	101.60

Name: PV array 10
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



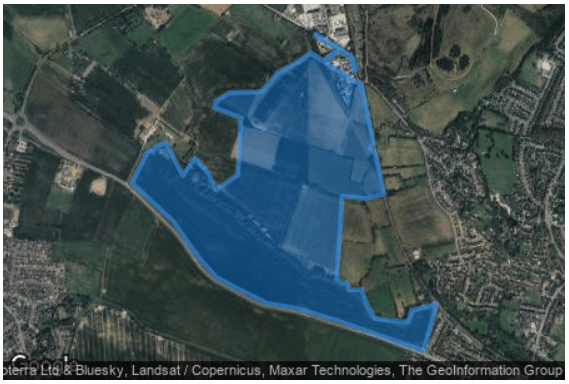
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.410383	-1.267270	112.54	3.80	116.34
2	53.407601	-1.266519	126.37	3.80	130.17
3	53.407665	-1.265940	127.34	3.80	131.14
4	53.407473	-1.265049	127.46	3.80	131.26
5	53.407179	-1.264910	127.80	3.80	131.60
6	53.407454	-1.263011	126.01	3.80	129.81
7	53.408394	-1.262592	121.71	3.80	125.51
8	53.409507	-1.259213	108.80	3.80	112.60
9	53.410569	-1.258783	105.35	3.80	109.15
10	53.410825	-1.259438	105.63	3.80	109.43
11	53.410140	-1.260157	108.59	3.80	112.39
12	53.410626	-1.263654	109.07	3.80	112.87

Name: PV array 11
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.374099	-1.272970	117.32	3.80	121.12
2	53.374266	-1.270481	113.86	3.80	117.66
3	53.374093	-1.269837	112.01	3.80	115.81
4	53.374534	-1.269805	113.32	3.80	117.12
5	53.375462	-1.268883	108.61	3.80	112.41
6	53.376647	-1.266769	99.76	3.80	103.56
7	53.377613	-1.268893	102.21	3.80	106.01
8	53.378067	-1.268003	104.87	3.80	108.67
9	53.379026	-1.267112	104.54	3.80	108.34
10	53.379851	-1.265610	108.03	3.80	111.83
11	53.381644	-1.267863	109.90	3.80	113.70
12	53.382597	-1.268851	110.61	3.80	114.41
13	53.383935	-1.270718	113.30	3.80	117.10
14	53.382805	-1.272376	110.71	3.80	114.51
15	53.380614	-1.274344	107.46	3.80	111.26
16	53.379100	-1.272220	105.96	3.80	109.76
17	53.377788	-1.269633	102.75	3.80	106.55
18	53.376462	-1.271103	110.48	3.80	114.28
19	53.375057	-1.272441	116.64	3.80	120.44

Name: PV Array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.351301	-1.228110	98.60	3.80	102.40
2	53.352505	-1.233861	94.50	3.80	98.30
3	53.353043	-1.236865	95.30	3.80	99.10
4	53.353248	-1.238882	95.00	3.80	98.80
5	53.353863	-1.240985	94.40	3.80	98.20
6	53.354324	-1.242401	94.20	3.80	98.00
7	53.355143	-1.243645	96.90	3.80	100.70
8	53.356578	-1.245319	96.60	3.80	100.40
9	53.358166	-1.248194	95.70	3.80	99.50
10	53.359446	-1.247079	93.00	3.80	96.80
11	53.359830	-1.245834	91.40	3.80	95.20
12	53.359472	-1.245534	91.40	3.80	95.20
13	53.358473	-1.244675	94.60	3.80	98.40
14	53.359190	-1.243860	92.80	3.80	96.60
15	53.358575	-1.242916	93.00	3.80	96.80
16	53.357884	-1.242401	92.50	3.80	96.30
17	53.358499	-1.240899	95.20	3.80	99.00
18	53.360829	-1.240684	94.30	3.80	98.10
19	53.361239	-1.242530	91.00	3.80	94.80
20	53.361521	-1.242401	91.20	3.80	95.00
21	53.361854	-1.241457	91.60	3.80	95.40
22	53.361905	-1.239225	94.50	3.80	98.30
23	53.362673	-1.238152	94.00	3.80	97.80
24	53.363211	-1.236521	95.50	3.80	99.30
25	53.363493	-1.235921	96.50	3.80	100.30
26	53.363134	-1.234977	97.70	3.80	101.50
27	53.363595	-1.234161	98.40	3.80	102.20
28	53.363671	-1.234108	98.50	3.80	102.30
29	53.364184	-1.235588	98.00	3.80	101.80
30	53.364254	-1.235513	98.00	3.80	101.80
31	53.363313	-1.232981	99.00	3.80	102.80
32	53.362813	-1.232745	99.00	3.80	102.80
33	53.362762	-1.232927	99.00	3.80	102.80
34	53.363294	-1.233110	99.00	3.80	102.80
35	53.363595	-1.233968	98.40	3.80	102.20
36	53.363063	-1.234816	98.10	3.80	101.90
37	53.362173	-1.232391	99.60	3.80	103.40
38	53.359779	-1.231554	96.40	3.80	100.20
39	53.359574	-1.231833	96.00	3.80	99.80
40	53.359420	-1.231468	96.50	3.80	100.30
41	53.357717	-1.230846	97.40	3.80	101.20
42	53.357538	-1.232069	96.00	3.80	99.80
43	53.357627	-1.233721	96.50	3.80	100.30
44	53.354208	-1.234086	93.30	3.80	97.10
45	53.354054	-1.233636	92.60	3.80	96.40
46	53.354118	-1.233442	92.30	3.80	96.10
47	53.353798	-1.233206	92.00	3.80	95.80
48	53.353798	-1.232391	92.00	3.80	95.80
49	53.353132	-1.231962	92.10	3.80	95.90
50	53.352632	-1.231468	93.40	3.80	97.20
51	53.352492	-1.229537	94.80	3.80	98.60
52	53.352492	-1.229172	94.80	3.80	98.60
53	53.352965	-1.228936	93.90	3.80	97.70
54	53.353234	-1.227220	94.00	3.80	97.80

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382537	-1.268075	110.00	3.80	113.80
2	53.383868	-1.269835	112.10	3.80	115.90
3	53.383753	-1.268998	111.50	3.80	115.30
4	53.384745	-1.269331	118.00	3.80	121.80
5	53.385205	-1.264202	109.60	3.80	113.40
6	53.384572	-1.264106	108.90	3.80	112.70
7	53.384898	-1.259394	106.60	3.80	110.40
8	53.383561	-1.259029	105.10	3.80	108.90
9	53.382793	-1.258965	104.70	3.80	108.50
10	53.382251	-1.262063	105.50	3.80	109.30

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382020	-1.265825	108.40	3.80	112.20
2	53.380253	-1.263379	109.40	3.80	113.20
3	53.379660	-1.264794	105.80	3.80	109.60
4	53.376873	-1.261473	99.90	3.80	103.70
5	53.378812	-1.258855	102.90	3.80	106.70
6	53.379353	-1.258866	106.10	3.80	109.90
7	53.379231	-1.257761	106.00	3.80	109.80
8	53.379455	-1.256495	102.90	3.80	106.70
9	53.382220	-1.255343	100.00	3.80	103.80
10	53.382412	-1.258540	104.00	3.80	107.80
11	53.381913	-1.261587	107.30	3.80	111.10

Name: PV array 6
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.382270	-1.254613	100.50	3.80	104.30
2	53.380427	-1.254141	98.90	3.80	102.70
3	53.378392	-1.252252	98.30	3.80	102.10
4	53.378648	-1.248969	99.80	3.80	103.60
5	53.380708	-1.249828	103.10	3.80	106.90
6	53.380427	-1.252145	100.70	3.80	104.50
7	53.382731	-1.253304	103.90	3.80	107.70

Name: PV array 7
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.386452	-1.273855	113.47	3.80	117.27
2	53.386094	-1.273190	114.86	3.80	118.66
3	53.385172	-1.275250	117.69	3.80	121.49
4	53.383803	-1.275850	112.85	3.80	116.65
5	53.383278	-1.277009	112.89	3.80	116.69
6	53.383368	-1.277267	113.27	3.80	117.07
7	53.385505	-1.277138	115.86	3.80	119.66
8	53.387111	-1.276322	110.56	0.00	110.56
9	53.386427	-1.274971	114.74	3.80	118.54

Name: PV array 8
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.383496	-1.279305	110.60	3.80	114.40
2	53.385288	-1.279198	116.00	3.80	119.80
3	53.387694	-1.280249	113.50	3.80	117.30
4	53.390010	-1.281537	102.80	3.80	106.60
5	53.387425	-1.283275	111.50	3.80	115.30
6	53.384725	-1.281344	109.50	3.80	113.30
7	53.384341	-1.281558	107.90	3.80	111.70
8	53.383521	-1.280292	106.90	3.80	110.70

Name: PV array 9
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.414203	-1.256784	117.74	3.80	121.54
2	53.412514	-1.257525	110.33	3.80	114.13
3	53.412591	-1.261838	109.98	3.80	113.78
4	53.412949	-1.262996	111.29	3.80	115.09
5	53.412975	-1.264005	112.22	3.80	116.02
6	53.412009	-1.263619	107.45	3.80	111.25
7	53.411082	-1.264852	108.34	3.80	112.14
8	53.410960	-1.267932	111.07	3.80	114.87
9	53.411843	-1.267937	113.38	3.80	117.18
10	53.411958	-1.264702	111.92	3.80	115.72
11	53.413189	-1.265405	117.88	3.80	121.68
12	53.413682	-1.265721	119.28	3.80	123.08
13	53.414251	-1.256795	117.76	3.80	121.56

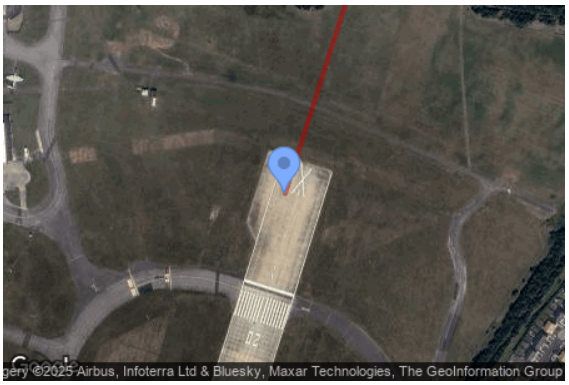
Flight Path Receptors

Name: 02
Description: None
Threshold height: 52 m
Direction: 17.7°
Glide slope: 3.1°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.463085	-1.010804	19.50	52.00	71.50
Two-mile	53.435541	-1.025586	23.80	222.00	245.80

Name: 20
Description: None
Threshold height: 26 m
Direction: 197.7°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.487357	-0.997922	7.70	26.00	33.70
Two-mile	53.514901	-0.983131	3.00	199.40	202.40

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	0	0.0	0	0.0	-
PV array 10	25.0	180.0	0	0.0	0	0.0	-
PV array 11	25.0	180.0	0	0.0	0	0.0	-
PV Array 2	25.0	180.0	0	0.0	0	0.0	-
PV array 4	25.0	180.0	0	0.0	0	0.0	-
PV array 5	25.0	180.0	0	0.0	0	0.0	-
PV array 6	25.0	180.0	0	0.0	0	0.0	-
PV array 7	25.0	180.0	0	0.0	0	0.0	-
PV array 8	25.0	180.0	0	0.0	0	0.0	-
PV array 9	25.0	180.0	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV: PV array 1 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 1 and FP: 02

No glare found

PV array 1 and FP: 20

No glare found

PV: PV array 10 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 10 and FP: 02

No glare found

PV array 10 and FP: 20

No glare found

PV: PV array 11 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 11 and FP: 02

No glare found

PV array 11 and FP: 20

No glare found

PV: PV Array 2 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV Array 2 and FP: 02

No glare found

PV Array 2 and FP: 20

No glare found

PV: PV array 4 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 4 and FP: 02

No glare found

PV array 4 and FP: 20

No glare found

PV: PV array 5 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 5 and FP: 02

No glare found

PV array 5 and FP: 20

No glare found

PV: PV array 6 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 6 and FP: 02

No glare found

PV array 6 and FP: 20

No glare found

PV: PV array 7 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 7 and FP: 02

No glare found

PV array 7 and FP: 20

No glare found

PV: PV array 8 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 8 and FP: 02

No glare found

PV array 8 and FP: 20

No glare found

PV: PV array 9 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
02	0	0.0	0	0.0
20	0	0.0	0	0.0

PV array 9 and FP: 02

No glare found

PV array 9 and FP: 20

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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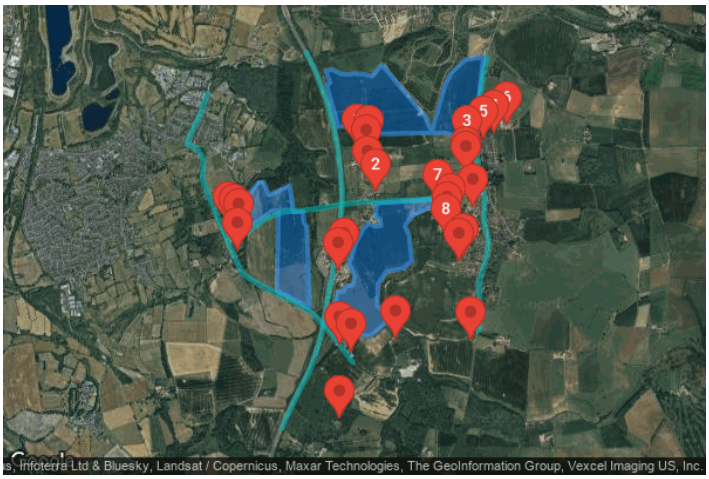
1.3 Whitestone 3

FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 3**
Site configuration: **JS W3 - RR and Transport-temp-9**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153773.25517

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	8.0	180.0	25,647	427.4	45,993	766.5	-
PV array 2	8.0	180.0	108,052	1,800.9	121,711	2,028.5	-
PV array 3	8.0	180.0	21,577	359.6	41,891	698.2	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

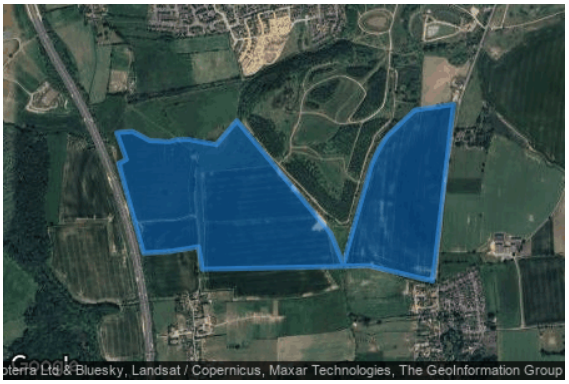
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	2,464	41.1	3,918	65.3
Route 4	8,751	145.8	19,323	322.1
Route 3	96,990	1,616.5	108,172	1,802.9
Route 2	548	9.1	2,540	42.3
OP 1	790	13.2	2,637	44.0
OP 2	1,075	17.9	0	0.0
OP 3	561	9.3	2,211	36.9
OP 4	1,549	25.8	5,116	85.3
OP 5	1,870	31.2	5,924	98.7
OP 6	1,085	18.1	4,093	68.2
OP 7	2,659	44.3	3,409	56.8
OP 8	2,218	37.0	3,195	53.2
OP 9	3,221	53.7	4,011	66.8
OP 10	3,266	54.4	4,443	74.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 11	511	8.5	1,297	21.6
OP 12	546	9.1	1,052	17.5
OP 13	1,999	33.3	415	6.9
OP 14	2,065	34.4	2,212	36.9
OP 15	2,388	39.8	3,205	53.4
OP 16	2,665	44.4	2,324	38.7
OP 17	840	14.0	433	7.2
OP 18	0	0.0	0	0.0
OP 19	1,731	28.9	3,713	61.9
OP 20	0	0.0	0	0.0
OP 21	3,410	56.8	2,929	48.8
OP 22	915	15.2	5,474	91.2
OP 23	1,731	28.9	4,250	70.8
OP 24	1,849	30.8	3,256	54.3
OP 25	2,124	35.4	3,373	56.2
OP 26	2,749	45.8	2,910	48.5
OP 27	770	12.8	1,337	22.3
OP 28	687	11.4	1,899	31.6
OP 29	1,249	20.8	524	8.7

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332141	-1.279756	90.99	3.80	94.79
2	53.332179	-1.281114	93.71	3.80	97.51
3	53.332559	-1.282304	96.34	3.80	100.14
4	53.332507	-1.283377	99.28	3.80	103.08
5	53.331405	-1.282712	97.51	3.80	101.31
6	53.331252	-1.283248	100.06	3.80	103.86
7	53.327587	-1.281531	105.78	3.80	109.58
8	53.327651	-1.279665	115.20	3.80	119.00
9	53.327843	-1.277755	105.29	3.80	109.09
10	53.326920	-1.277497	106.91	3.80	110.71
11	53.327036	-1.267863	90.02	3.80	93.82
12	53.327074	-1.266125	91.84	3.80	95.64
13	53.326433	-1.261662	99.50	3.80	103.30
14	53.333661	-1.260224	89.56	3.80	93.36
15	53.333430	-1.262885	88.21	3.80	92.01
16	53.332367	-1.264794	90.44	3.80	94.24
17	53.331828	-1.265352	89.00	3.80	92.80
18	53.331226	-1.265846	88.66	3.80	92.46
19	53.327122	-1.267807	90.13	3.80	93.93
20	53.328381	-1.268657	89.34	3.80	93.14
21	53.332994	-1.275116	89.05	3.80	92.85
22	53.332021	-1.276532	88.05	3.80	91.85
23	53.332226	-1.278399	90.83	3.80	94.63
24	53.332213	-1.279300	91.06	3.80	94.86

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.322460	-1.288645	97.50	3.80	101.30
2	53.321639	-1.291649	102.80	3.80	106.60
3	53.322780	-1.292454	93.40	3.80	97.20
4	53.322745	-1.293141	93.60	3.80	97.40
5	53.321896	-1.294396	96.50	3.80	100.30
6	53.320230	-1.295383	104.90	3.80	108.70
7	53.318691	-1.294911	109.70	3.80	113.50
8	53.320230	-1.291134	114.20	3.80	118.00
9	53.320204	-1.290276	114.80	3.80	118.60
10	53.313282	-1.290534	137.70	3.80	141.50
11	53.311795	-1.285684	130.10	3.80	133.90
12	53.318871	-1.286113	103.90	3.80	107.70
13	53.319230	-1.286521	102.90	3.80	106.70
14	53.320191	-1.286628	99.20	3.80	103.00
15	53.320165	-1.288044	105.20	3.80	109.00

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.310510	-1.282613	128.50	3.80	132.30
2	53.309613	-1.281969	123.20	3.80	127.00
3	53.309741	-1.280853	123.40	3.80	127.20
4	53.309305	-1.277999	116.70	3.80	120.50
5	53.309357	-1.277484	116.30	3.80	120.10
6	53.309331	-1.276776	113.30	3.80	117.10
7	53.310562	-1.274330	105.20	3.80	109.00
8	53.311292	-1.274695	105.50	3.80	109.30
9	53.311972	-1.275810	107.30	3.80	111.10
10	53.312651	-1.275746	105.90	3.80	109.70
11	53.313869	-1.275660	104.40	3.80	108.20
12	53.314920	-1.274502	103.80	3.80	107.60
13	53.315228	-1.271970	105.20	3.80	109.00
14	53.315831	-1.270704	104.50	3.80	108.30
15	53.318151	-1.271133	104.70	3.80	108.50
16	53.318933	-1.271733	104.80	3.80	108.60
17	53.319868	-1.270510	101.50	3.80	105.30
18	53.320663	-1.267635	95.70	3.80	99.50
19	53.321253	-1.267313	95.10	3.80	98.90
20	53.320907	-1.275875	110.60	3.80	114.40
21	53.319702	-1.276132	113.30	3.80	117.10
22	53.319471	-1.275381	114.10	3.80	117.90
23	53.318945	-1.275231	116.50	3.80	120.30
24	53.318881	-1.275896	119.00	3.80	122.80
25	53.319125	-1.277119	114.60	3.80	118.40
26	53.318753	-1.277763	113.90	3.80	117.70
27	53.317420	-1.278965	117.70	3.80	121.50
28	53.316356	-1.279523	117.50	3.80	121.30
29	53.315600	-1.279973	121.80	3.80	125.60
30	53.314536	-1.279093	119.30	3.80	123.10
31	53.313738	-1.279373	121.00	3.80	124.80
32	53.313662	-1.280360	125.70	3.80	129.50
33	53.313149	-1.280833	128.20	3.80	132.00
34	53.313238	-1.281562	128.30	3.80	132.10

Route Receptors

Name: Route 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



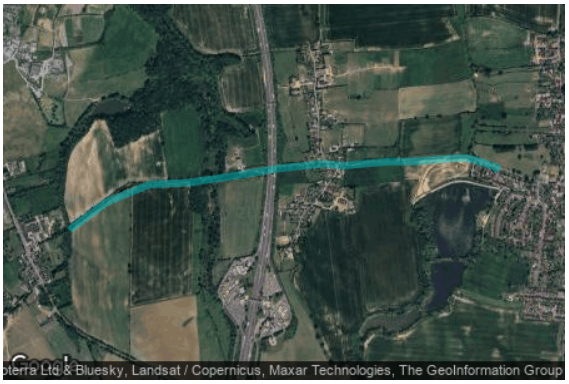
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.330501	-1.300663	59.90	1.50	61.40
2	53.328810	-1.301650	67.30	1.50	68.80
3	53.327221	-1.302894	72.70	1.50	74.20
4	53.326067	-1.303667	77.30	1.50	78.80
5	53.325657	-1.302143	85.50	1.50	87.00
6	53.324786	-1.301264	99.10	1.50	100.60
7	53.322940	-1.301392	105.10	1.50	106.60
8	53.321223	-1.300277	112.20	1.50	113.70
9	53.319480	-1.299075	118.00	1.50	119.50
10	53.317839	-1.297916	122.50	1.50	124.00
11	53.316198	-1.296758	126.00	1.50	127.50
12	53.314685	-1.295427	128.60	1.50	130.10
13	53.313711	-1.292809	133.40	1.50	134.90
14	53.312942	-1.290234	136.70	1.50	138.20
15	53.312173	-1.287660	137.10	1.50	138.60
16	53.311250	-1.285213	131.10	1.50	132.60
17	53.309916	-1.283068	125.80	1.50	127.30
18	53.308506	-1.281265	126.20	1.50	127.70
19	53.307019	-1.279420	129.20	1.50	130.70

Name: Route 4
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.333628	-1.259688	91.40	1.50	92.90
2	53.332039	-1.260289	102.00	1.50	103.50
3	53.330322	-1.260632	105.90	1.50	107.40
4	53.328502	-1.261061	102.80	1.50	104.30
5	53.326656	-1.261233	100.00	1.50	101.50
6	53.324734	-1.261147	105.20	1.50	106.70
7	53.323017	-1.260632	116.30	1.50	117.80
8	53.321197	-1.260031	113.20	1.50	114.70
9	53.319377	-1.260203	110.90	1.50	112.40
10	53.317531	-1.259430	120.10	1.50	121.60
11	53.315762	-1.259988	129.20	1.50	130.70
12	53.314018	-1.260846	139.60	1.50	141.10
13	53.311711	-1.260761	146.60	1.50	148.10
14	53.309788	-1.260975	136.60	1.50	138.10

Name: Route 3
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.318402	-1.294781	112.30	1.50	113.80
2	53.319466	-1.292378	117.80	1.50	119.30
3	53.320171	-1.289481	111.30	1.50	112.80
4	53.320274	-1.286541	99.10	1.50	100.60
5	53.320556	-1.283408	107.40	1.50	108.90
6	53.320851	-1.280447	106.50	1.50	108.00
7	53.321030	-1.277529	107.80	1.50	109.30
8	53.320953	-1.275984	111.00	1.50	112.50
9	53.321043	-1.274503	109.40	1.50	110.90
10	53.321120	-1.272991	107.20	1.50	108.70
11	53.321120	-1.271478	104.30	1.50	105.80
12	53.321261	-1.268452	95.80	1.50	97.30
13	53.321270	-1.267701	95.30	1.50	96.80
14	53.321171	-1.267004	95.40	1.50	96.90
15	53.320876	-1.265555	97.80	1.50	99.30
16	53.320830	-1.265730	98.60	1.50	100.10

Name: Route 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.334058	-1.286221	101.46	0.00	101.46
2	53.332571	-1.284933	102.48	0.00	102.48
3	53.330764	-1.283796	103.72	0.00	103.72
4	53.329137	-1.282916	105.49	0.00	105.49
5	53.327330	-1.282122	108.36	0.00	108.36
6	53.325562	-1.281543	108.46	0.00	108.46
7	53.323728	-1.281202	109.46	0.00	109.46
8	53.321985	-1.280945	110.49	0.00	110.49
9	53.320229	-1.281052	111.89	0.00	111.89
10	53.318392	-1.281333	118.41	0.00	118.41
11	53.316597	-1.281806	122.52	0.00	122.52
12	53.314828	-1.282299	126.72	0.00	126.72
13	53.313072	-1.282921	130.58	0.00	130.58
14	53.311349	-1.283406	132.63	0.00	132.63
15	53.309541	-1.283963	132.65	0.00	132.65
16	53.307785	-1.284800	131.77	0.00	131.77
17	53.306157	-1.285830	129.30	0.00	129.30
18	53.304567	-1.287225	127.34	0.00	127.34
19	53.301307	-1.289756	123.87	0.00	123.87

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.325780	-1.278642	113.30	2.00
OP 2	2	53.321845	-1.276003	112.00	2.00
OP 3	3	53.325621	-1.262612	101.60	2.00
OP 4	4	53.326941	-1.258567	102.50	2.00
OP 5	5	53.326448	-1.260252	101.00	2.00
OP 6	6	53.327736	-1.256754	100.90	2.00
OP 7	7	53.320963	-1.266795	97.80	2.00
OP 8	8	53.317996	-1.265680	108.90	2.00
OP 9	9	53.316201	-1.263115	119.90	2.00
OP 10	10	53.315830	-1.263845	120.90	2.00
OP 11	11	53.323805	-1.262659	106.90	2.00
OP 12	12	53.323344	-1.262734	107.70	2.00
OP 13	13	53.320511	-1.261699	108.30	2.00
OP 14	14	53.318949	-1.297626	117.80	2.00
OP 15	15	53.318789	-1.296725	113.10	2.00
OP 16	16	53.316764	-1.296199	119.80	2.00
OP 17	17	53.308488	-1.281366	126.70	2.00
OP 18	18	53.307886	-1.279509	128.70	2.00
OP 19	19	53.309030	-1.273113	114.50	2.00
OP 20	20	53.302066	-1.281255	135.50	2.00
OP 21	21	53.308953	-1.261997	131.00	2.00
OP 22	22	53.314933	-1.281447	129.50	2.00
OP 23	23	53.315760	-1.280643	123.00	2.00
OP 24	24	53.318939	-1.265461	106.50	2.00
OP 25	25	53.319702	-1.264925	104.70	2.00
OP 26	26	53.318372	-1.296070	110.40	2.00
OP 27	27	53.324801	-1.277393	108.40	2.00
OP 28	28	53.325640	-1.276921	106.40	2.00
OP 29	29	53.322962	-1.277082	112.80	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

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OP 15	2,388	39.8	3,205	53.4
OP 16	2,665	44.4	2,324	38.7
OP 17	840	14.0	433	7.2
OP 18	0	0.0	0	0.0
OP 19	1,731	28.9	3,713	61.9
OP 20	0	0.0	0	0.0
OP 21	3,410	56.8	2,929	48.8
OP 22	915	15.2	5,474	91.2
OP 23	1,731	28.9	4,250	70.8
OP 24	1,849	30.8	3,256	54.3
OP 25	2,124	35.4	3,373	56.2
OP 26	2,749	45.8	2,910	48.5

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 27	770	12.8	1,337	22.3
OP 28	687	11.4	1,899	31.6
OP 29	1,249	20.8	524	8.7

PV: PV array 1 potential temporary after-image

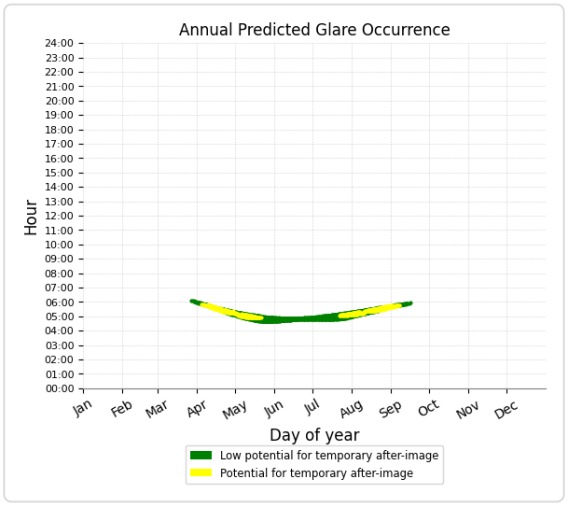
Receptor results ordered by category of glare

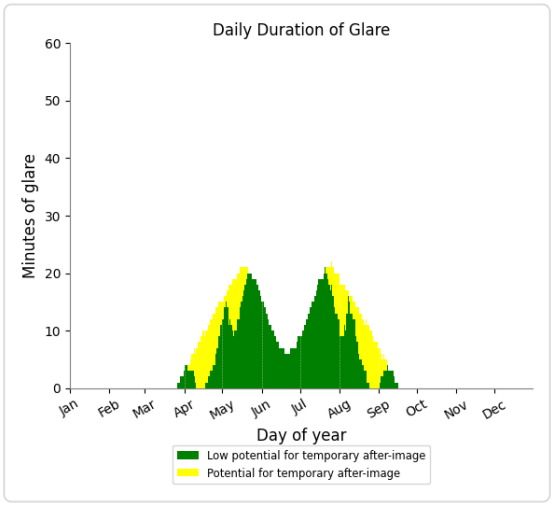
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	1,547	25.8	586	9.8
Route 4	8,309	138.5	17,543	292.4
Route 3	1,701	28.4	77	1.3
Route 2	73	1.2	458	7.6
OP 1	790	13.2	2,637	44.0
OP 3	561	9.3	2,211	36.9
OP 4	1,549	25.8	5,116	85.3
OP 5	1,870	31.2	5,924	98.7
OP 6	1,085	18.1	4,093	68.2
OP 11	511	8.5	1,297	21.6
OP 12	546	9.1	1,052	17.5
OP 14	1,002	16.7	291	4.8
OP 15	1,047	17.4	526	8.8
OP 26	1,132	18.9	422	7.0
OP 27	770	12.8	1,337	22.3
OP 28	687	11.4	1,899	31.6
OP 29	927	15.4	524	8.7
OP 2	388	6.5	0	0.0
OP 13	195	3.2	0	0.0
OP 16	957	15.9	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0

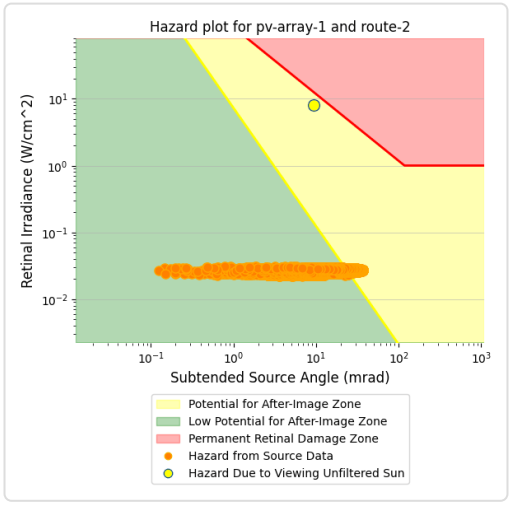
PV array 1 and Route: Route 1

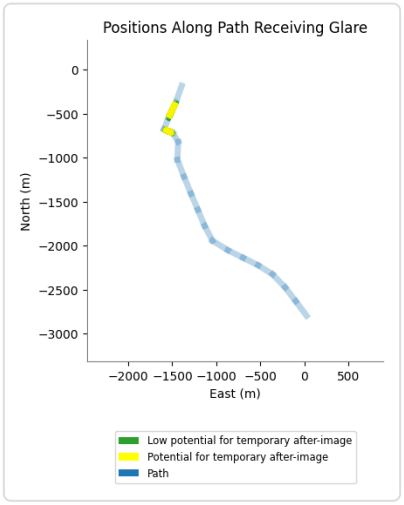
Yellow glare: 586 min.

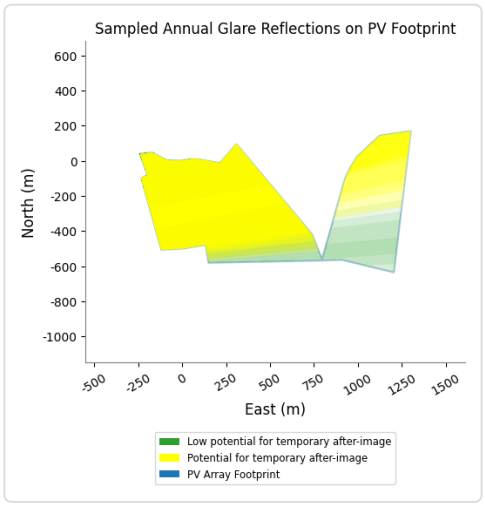
Green glare: 1,547 min.







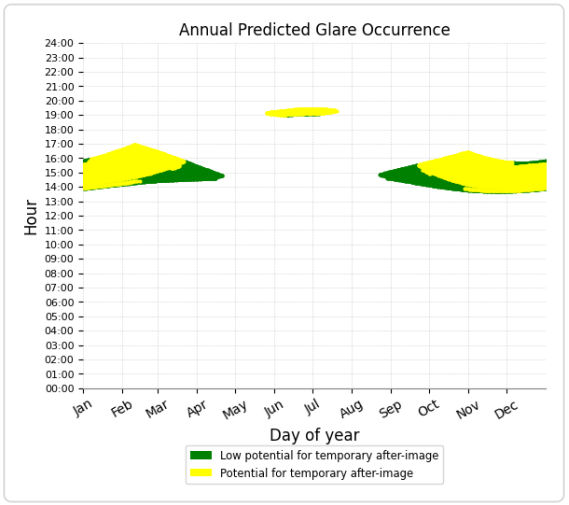


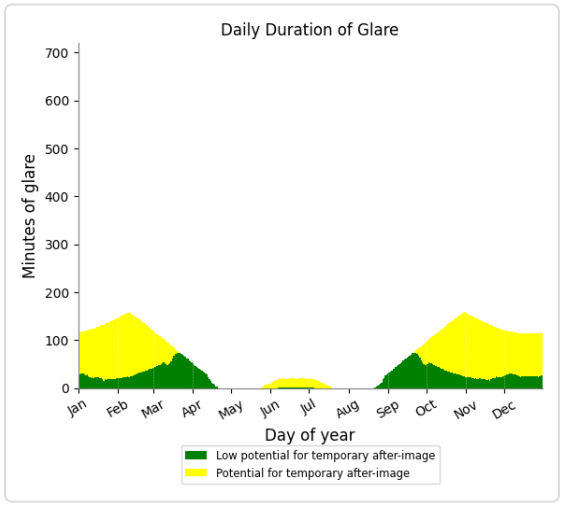


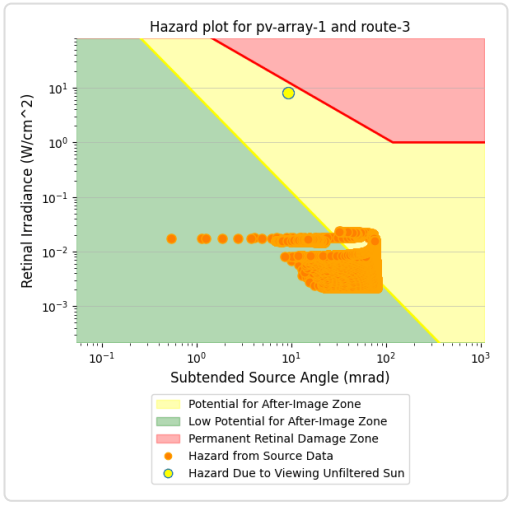
PV array 1 and Route: Route 4

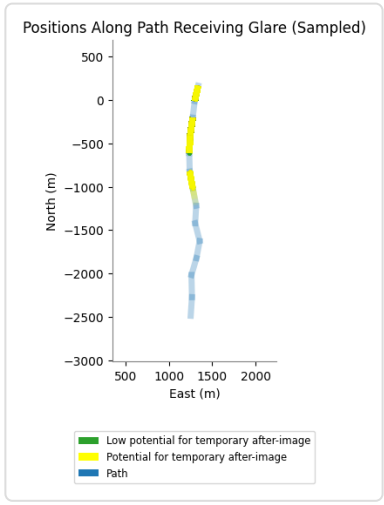
Yellow glare: 17,543 min.

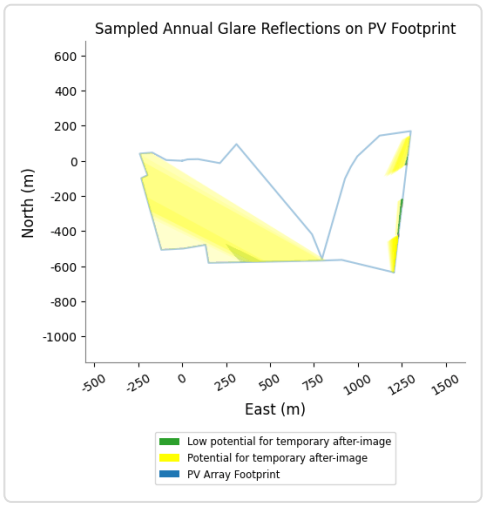
Green glare: 8,309 min.







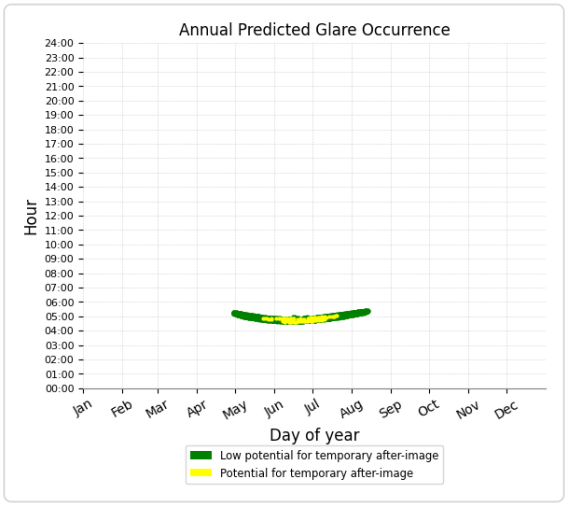


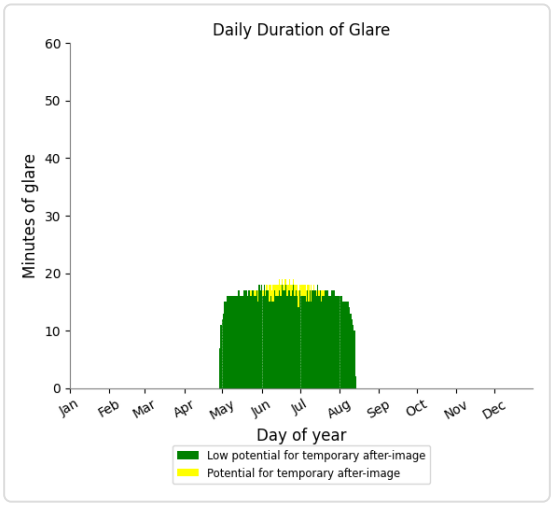


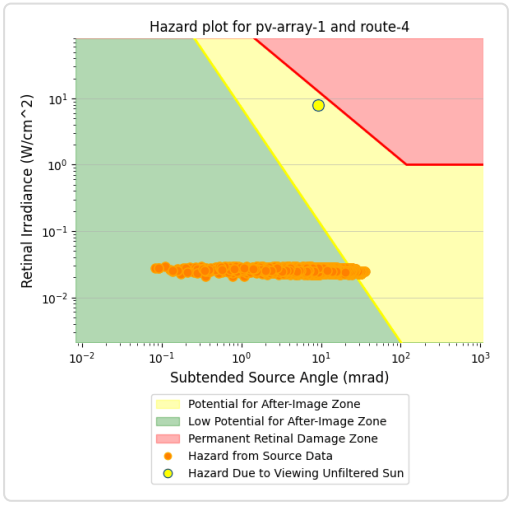
PV array 1 and Route: Route 3

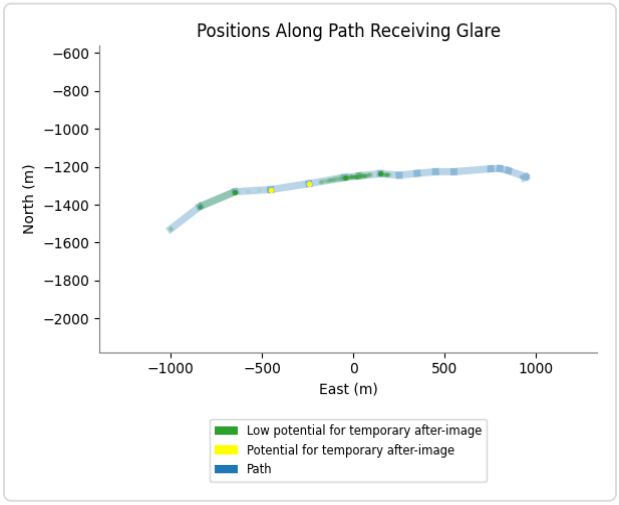
Yellow glare: 77 min.

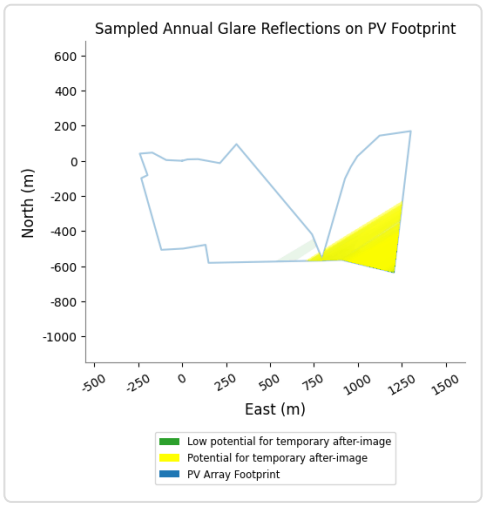
Green glare: 1,701 min.







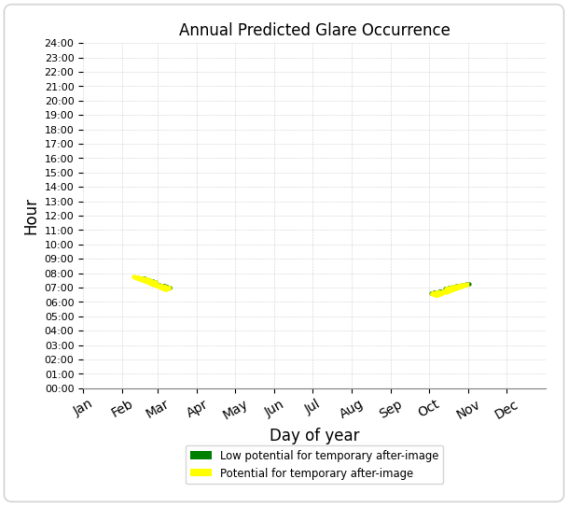


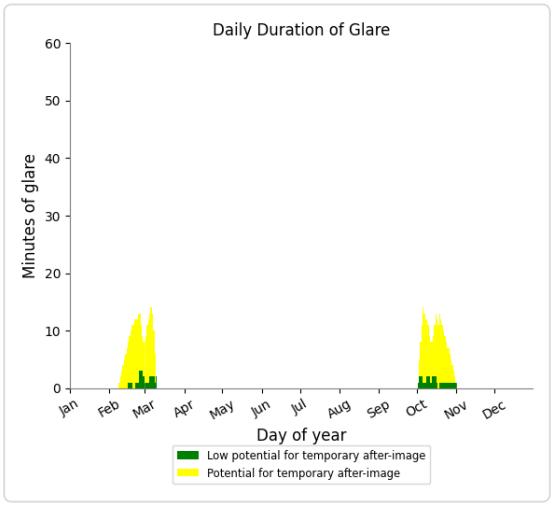


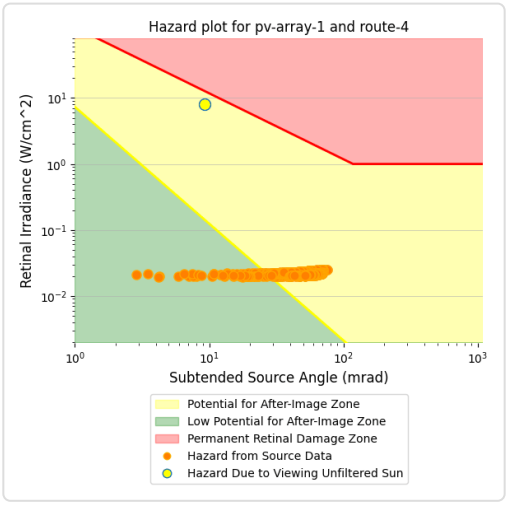
PV array 1 and Route: Route 2

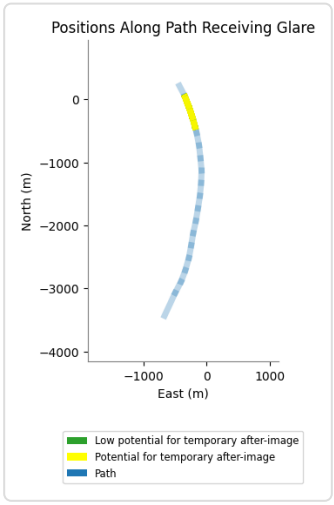
Yellow glare: 458 min.

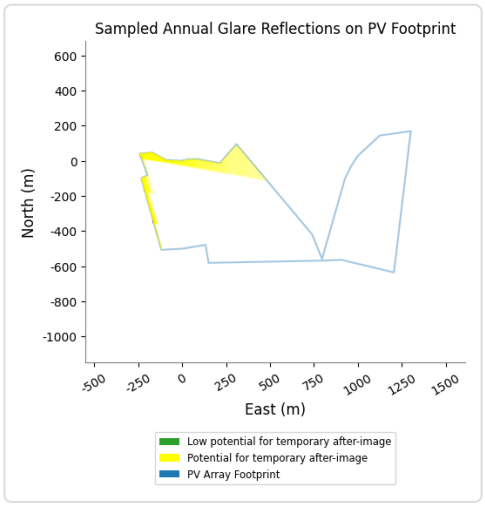
Green glare: 73 min.







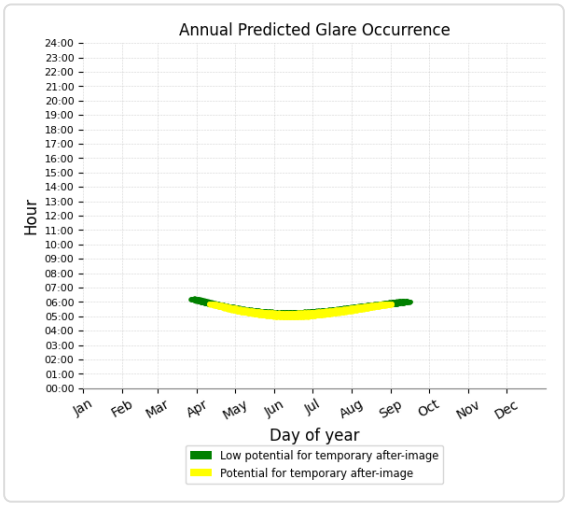


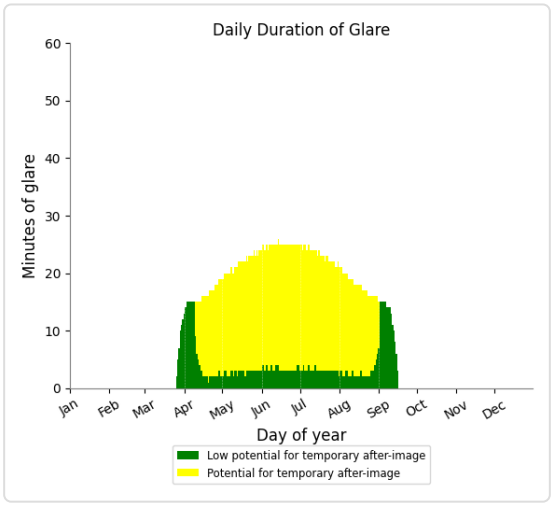


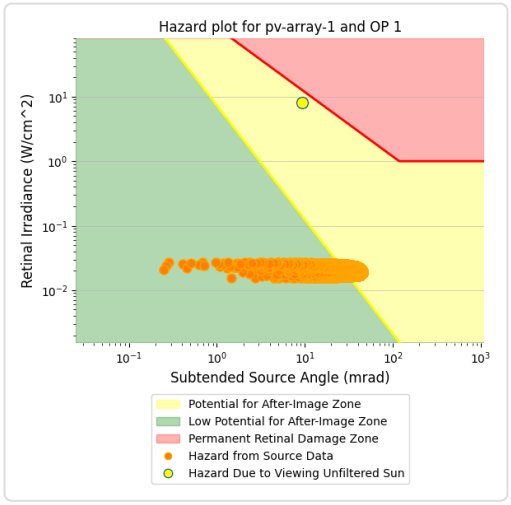
PV array 1 and OP 1

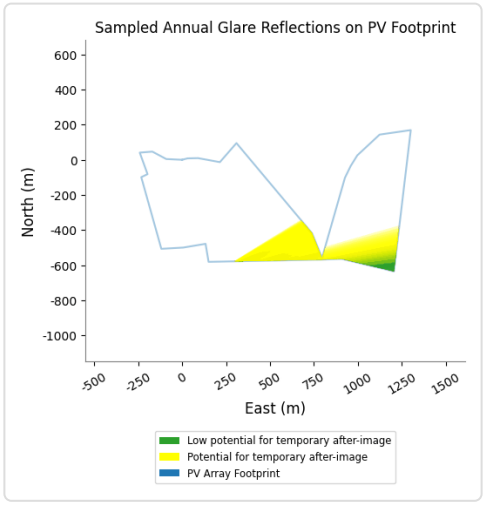
Yellow glare: 2,637 min.

Green glare: 790 min.





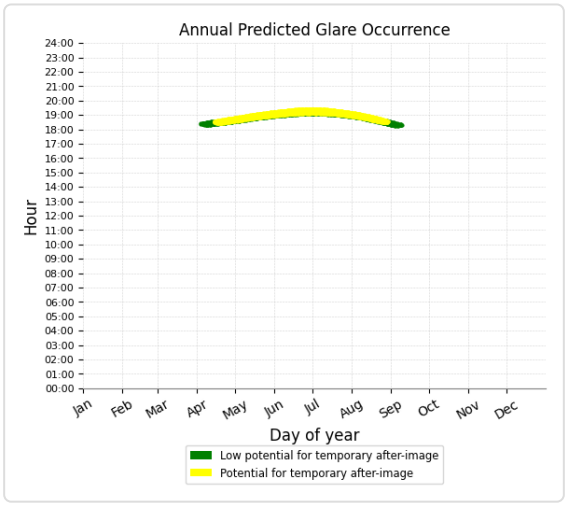


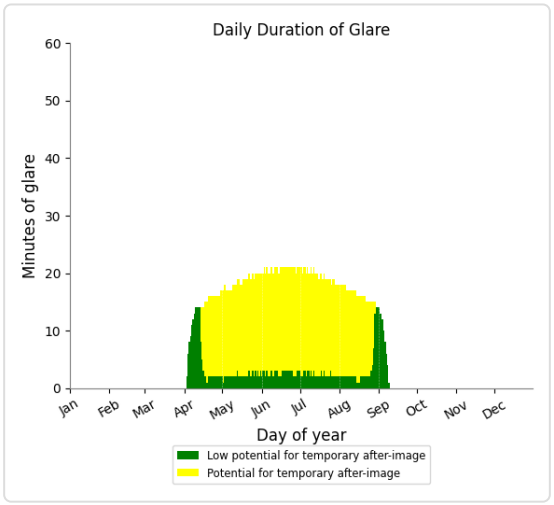


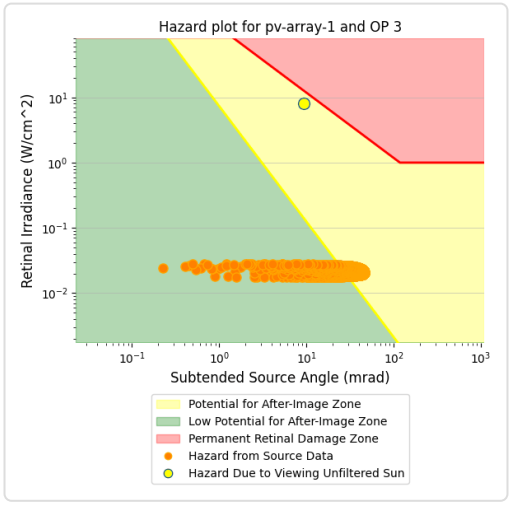
PV array 1 and OP 3

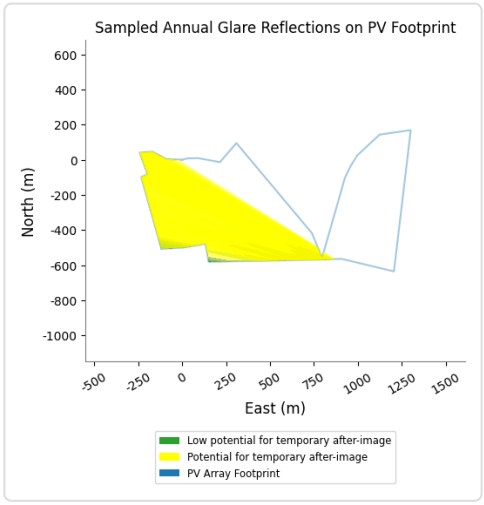
Yellow glare: 2,211 min.

Green glare: 561 min.





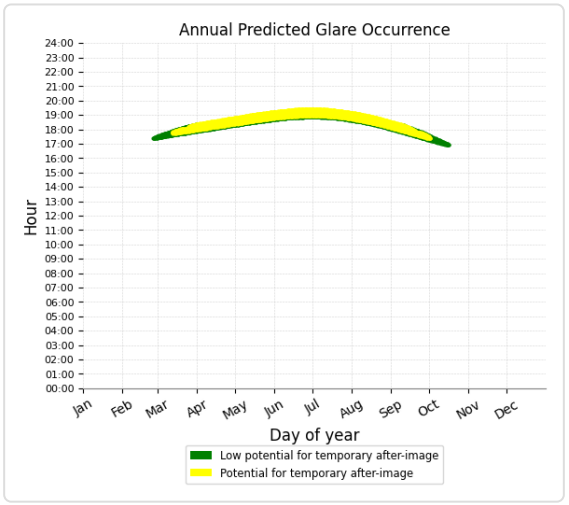


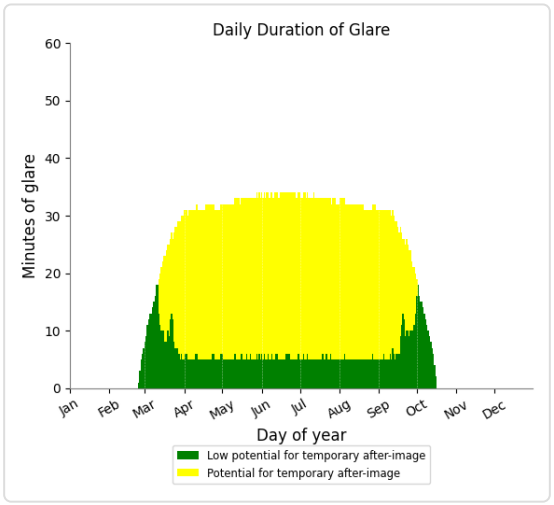


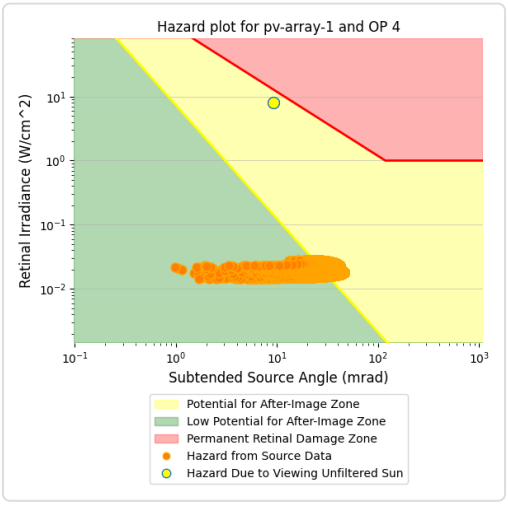
PV array 1 and OP 4

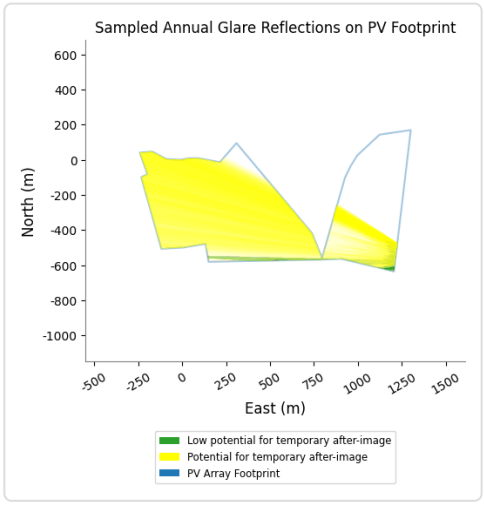
Yellow glare: 5,116 min.

Green glare: 1,549 min.





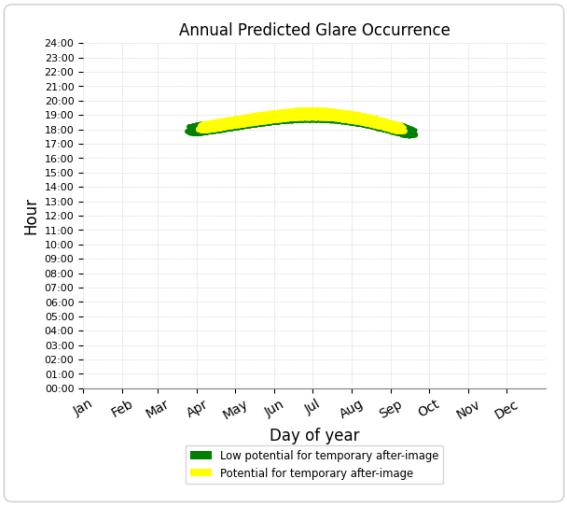


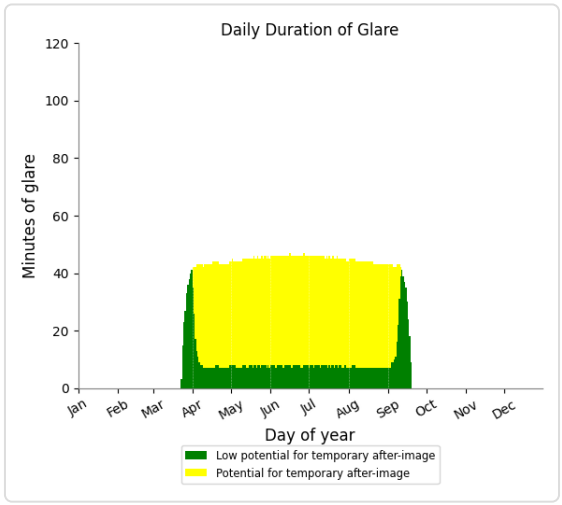


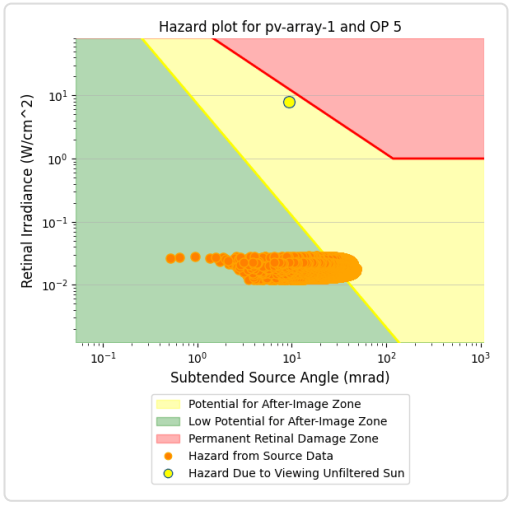
PV array 1 and OP 5

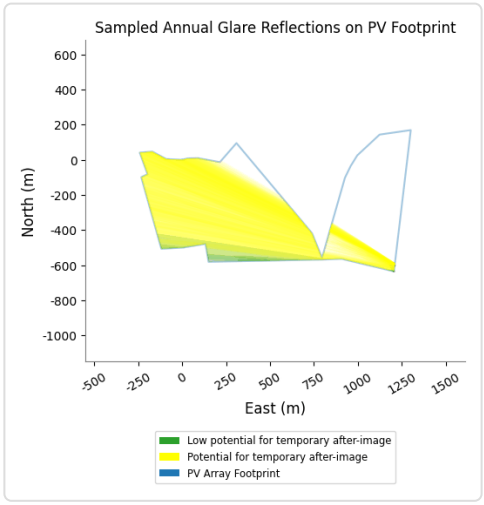
Yellow glare: 5,924 min.

Green glare: 1,870 min.





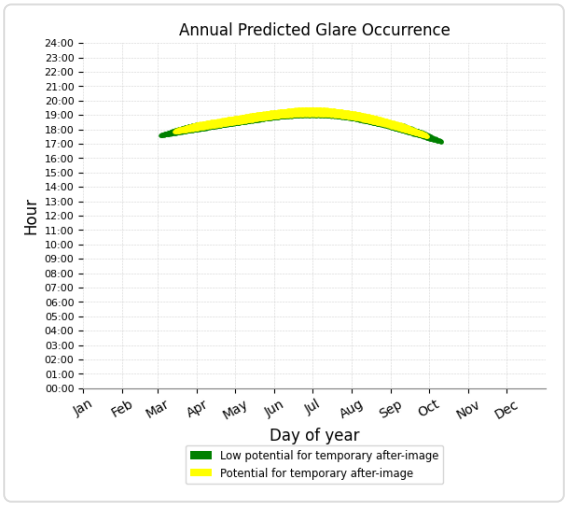


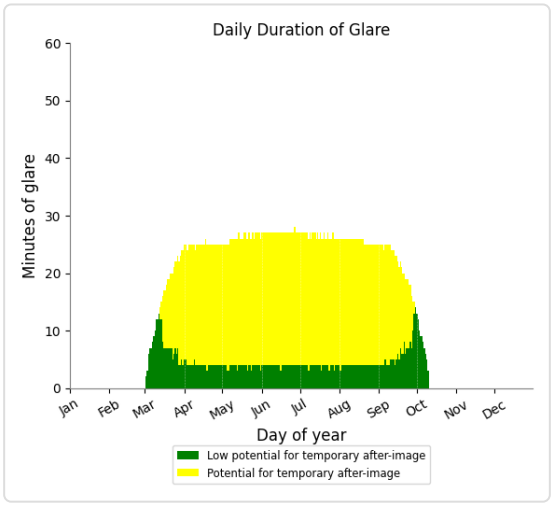


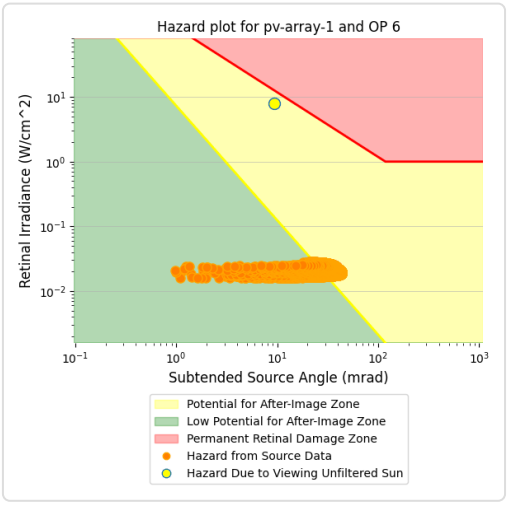
PV array 1 and OP 6

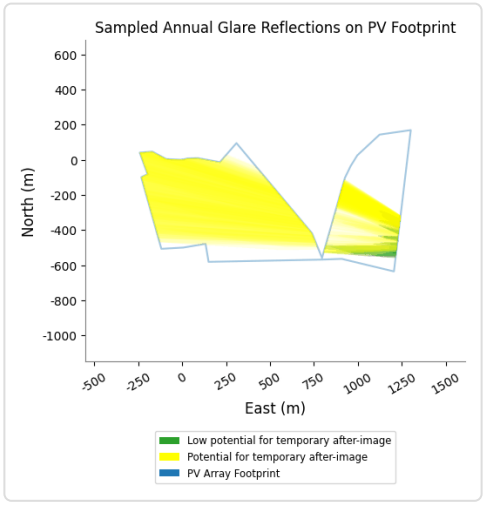
Yellow glare: 4,093 min.

Green glare: 1,085 min.





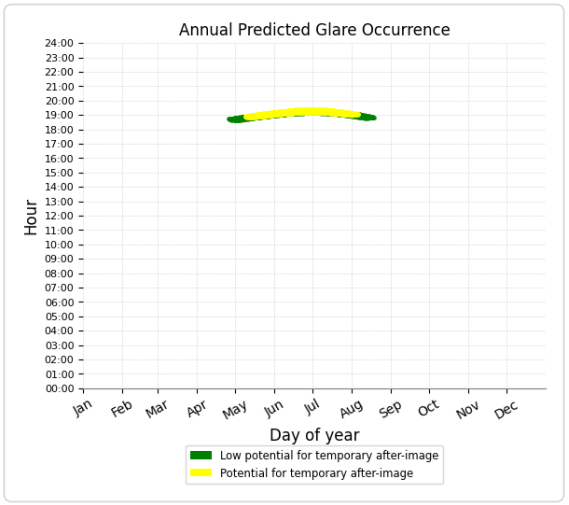


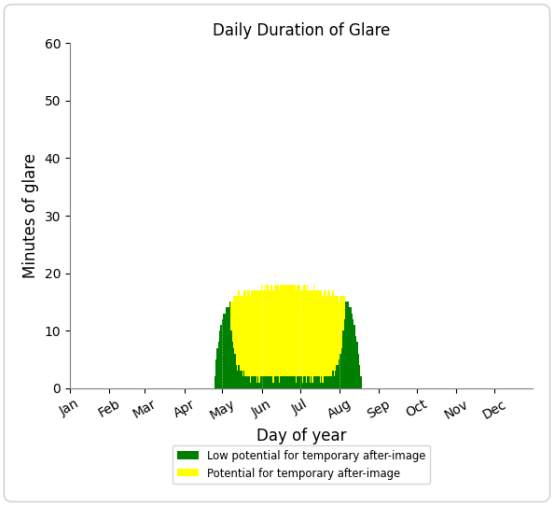


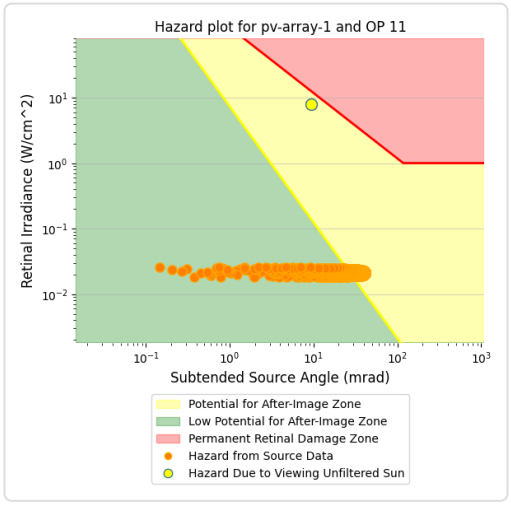
PV array 1 and OP 11

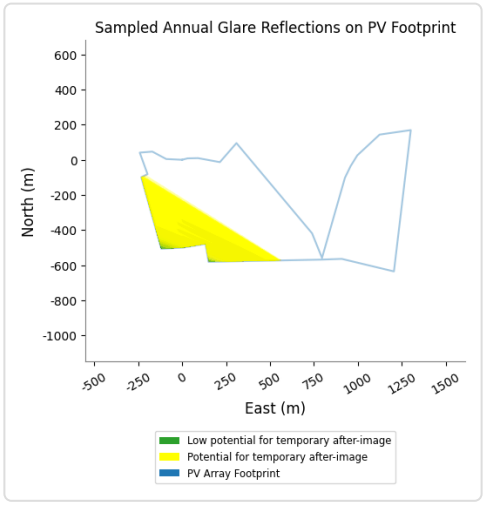
Yellow glare: 1,297 min.

Green glare: 511 min.





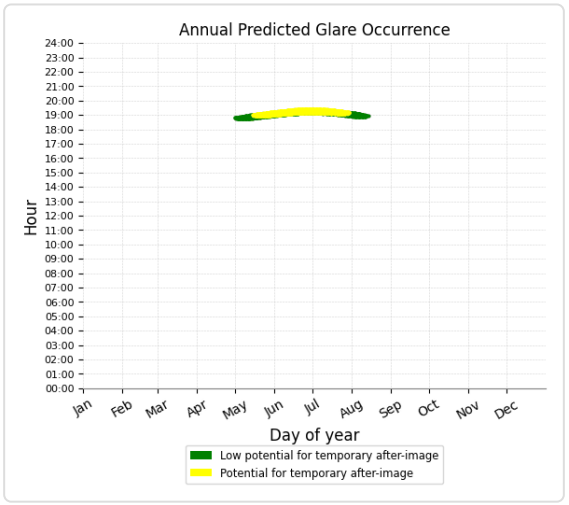


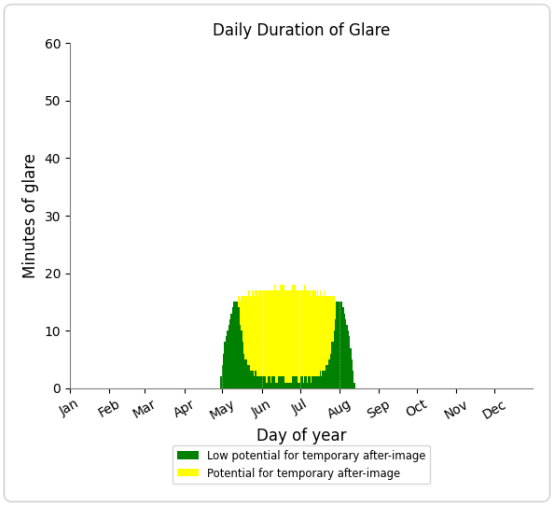


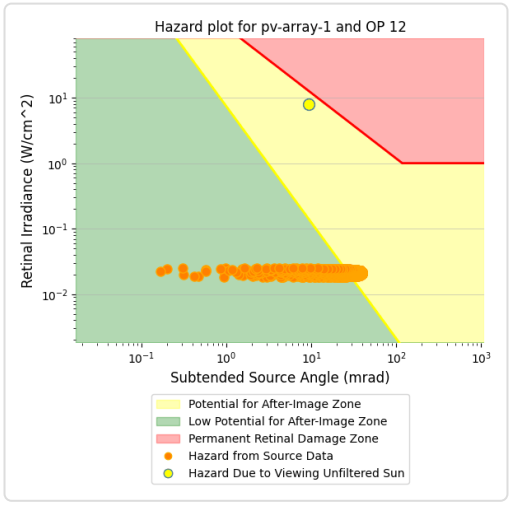
PV array 1 and OP 12

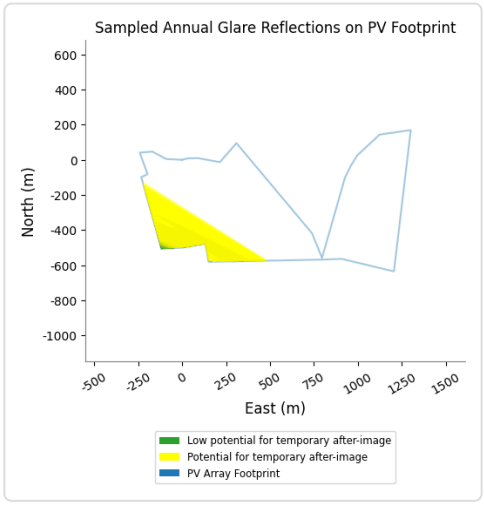
Yellow glare: 1,052 min.

Green glare: 546 min.





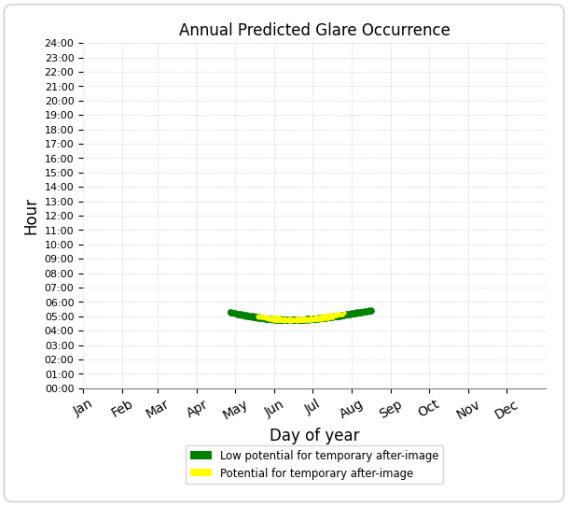


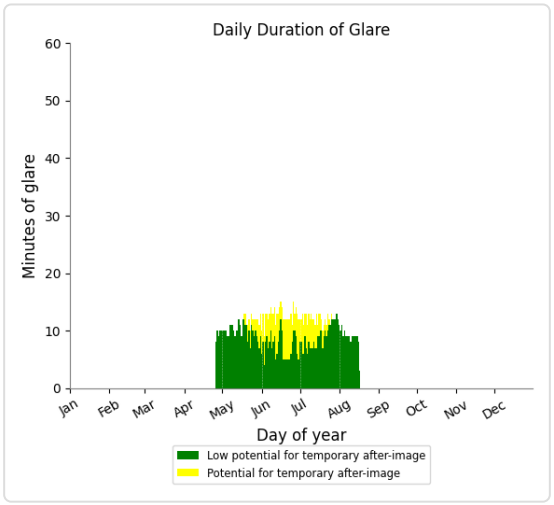


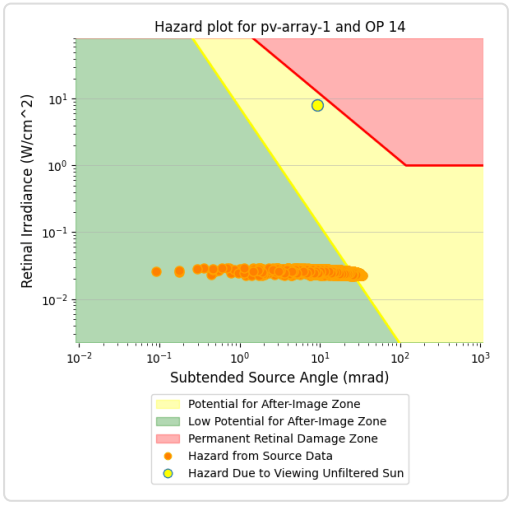
PV array 1 and OP 14

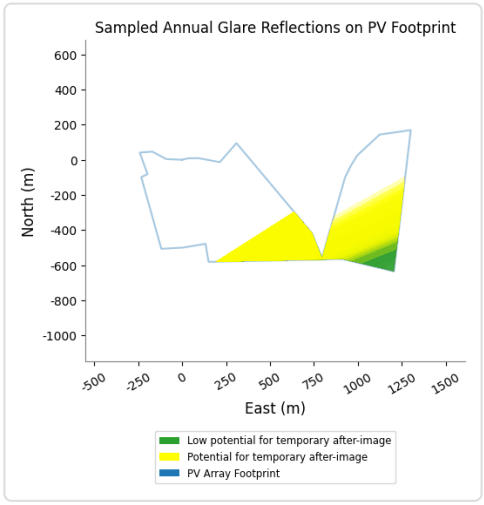
Yellow glare: 291 min.

Green glare: 1,002 min.





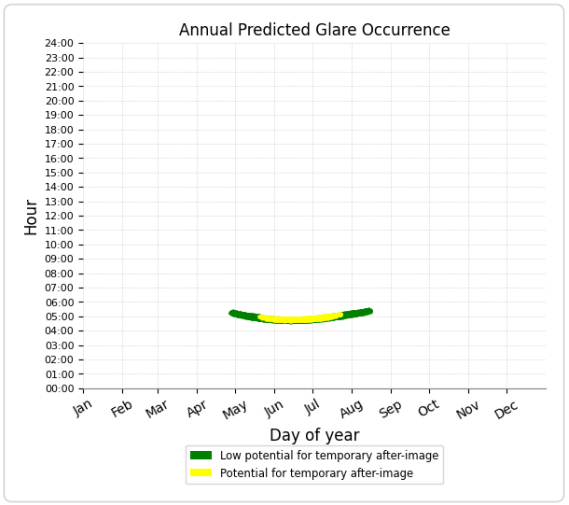


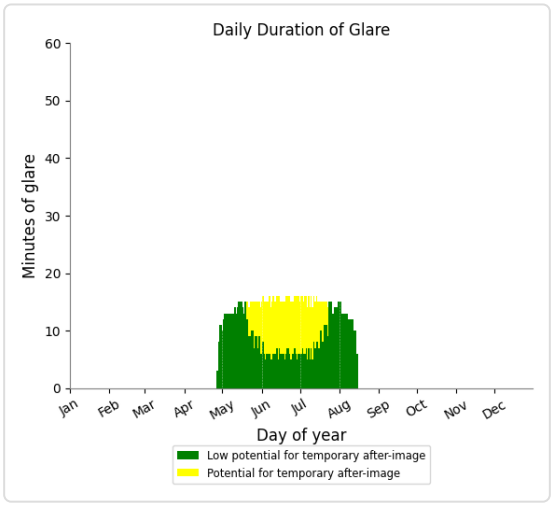


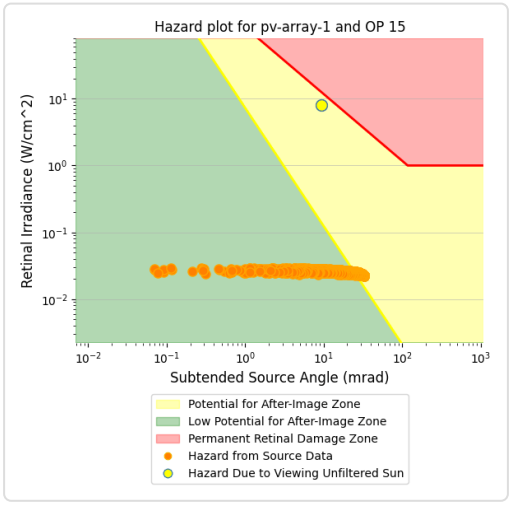
PV array 1 and OP 15

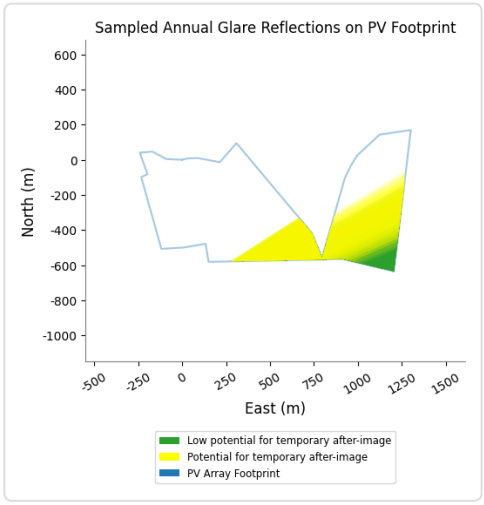
Yellow glare: 526 min.

Green glare: 1,047 min.





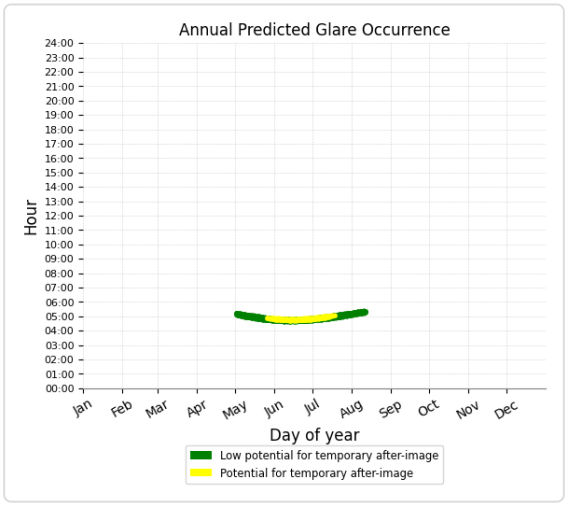


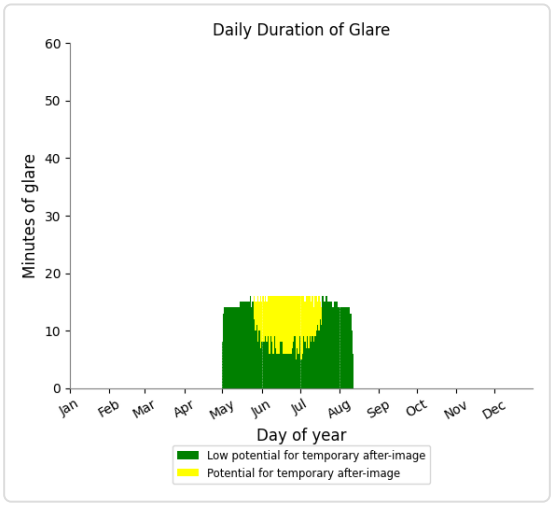


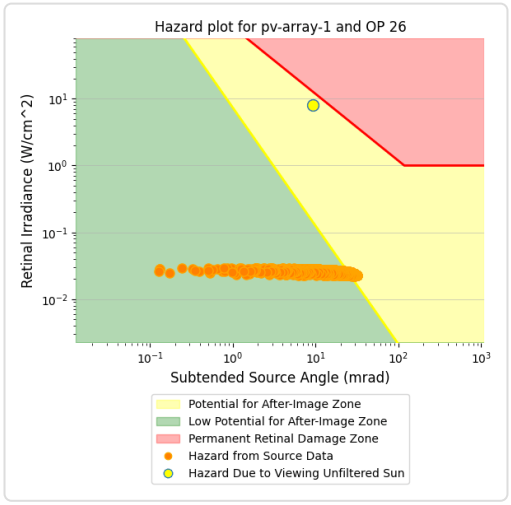
PV array 1 and OP 26

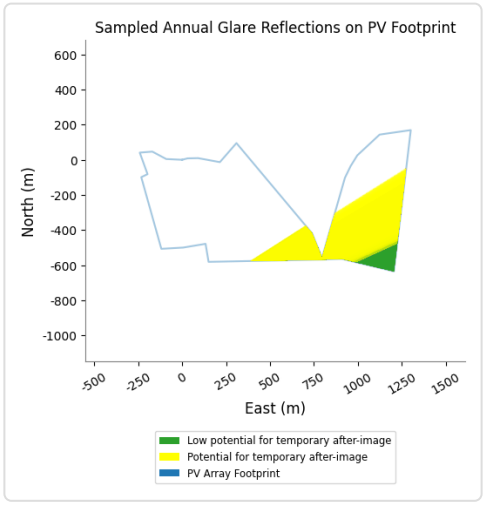
Yellow glare: 422 min.

Green glare: 1,132 min.





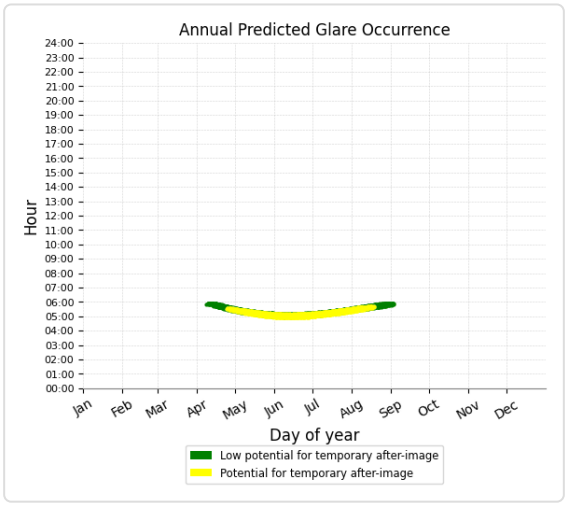


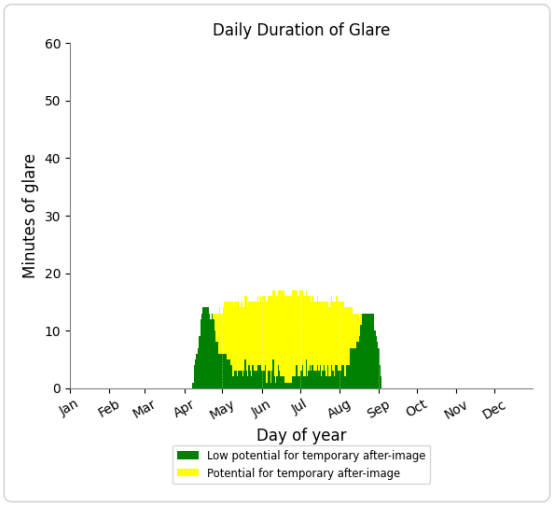


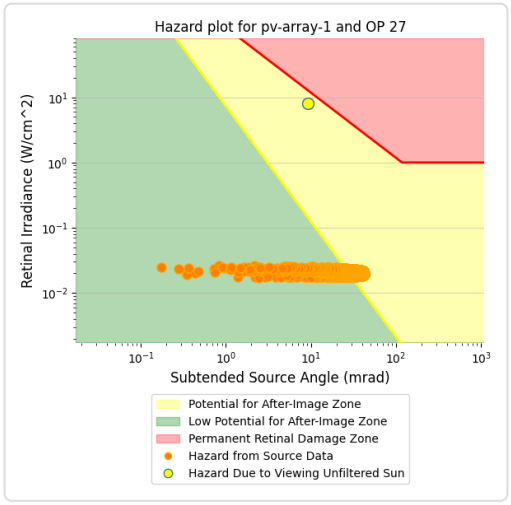
PV array 1 and OP 27

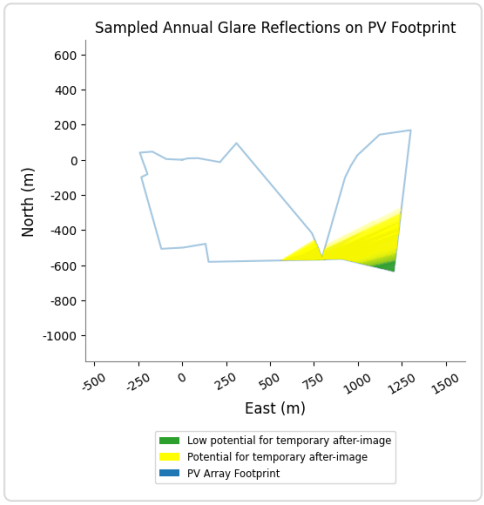
Yellow glare: 1,337 min.

Green glare: 770 min.





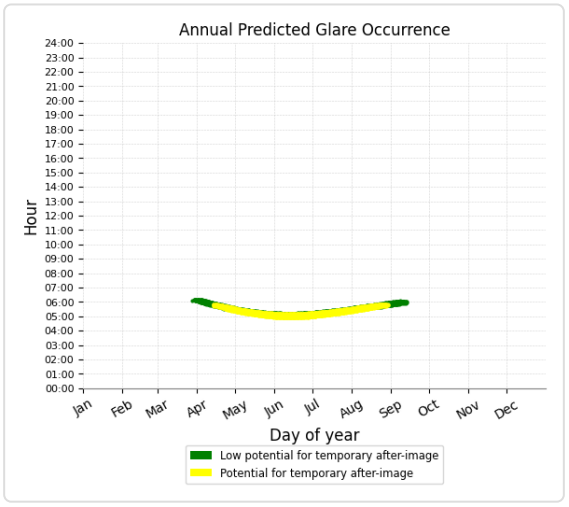


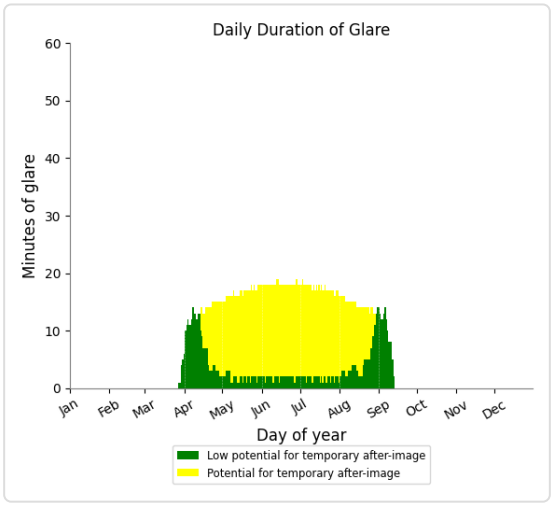


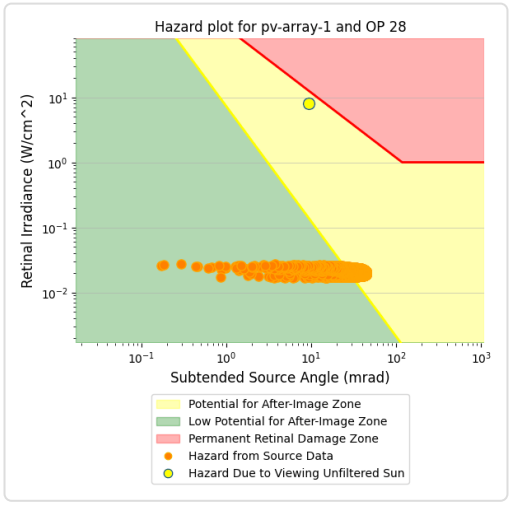
PV array 1 and OP 28

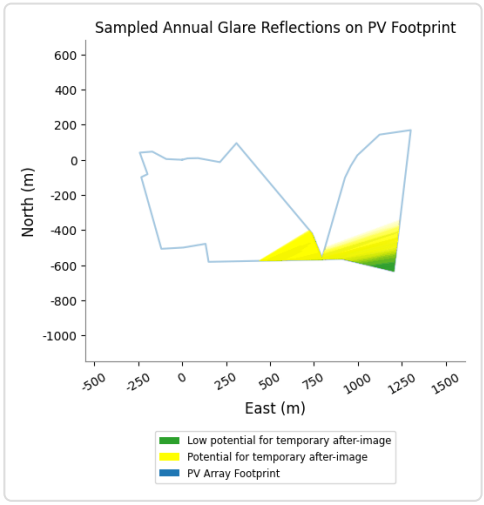
Yellow glare: 1,899 min.

Green glare: 687 min.





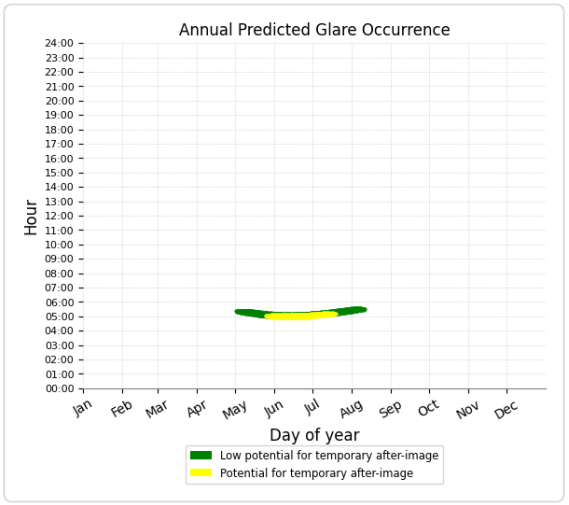


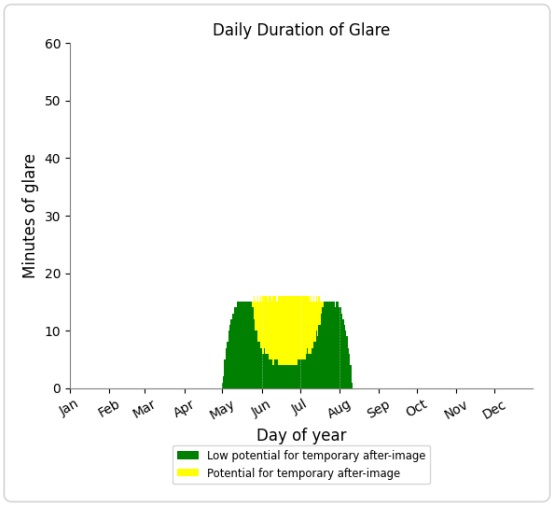


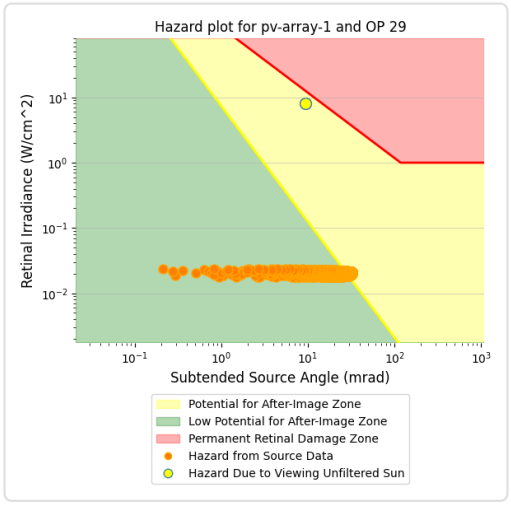
PV array 1 and OP 29

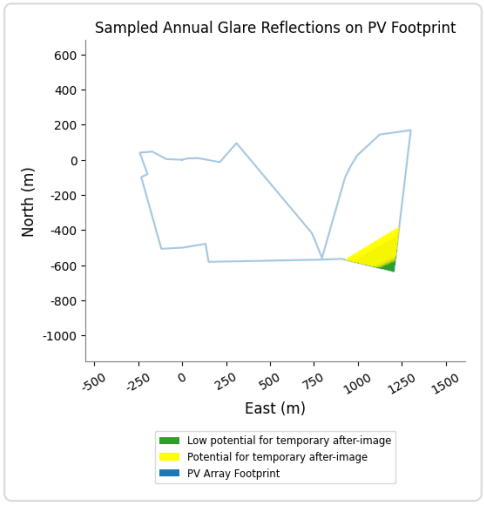
Yellow glare: 524 min.

Green glare: 927 min.





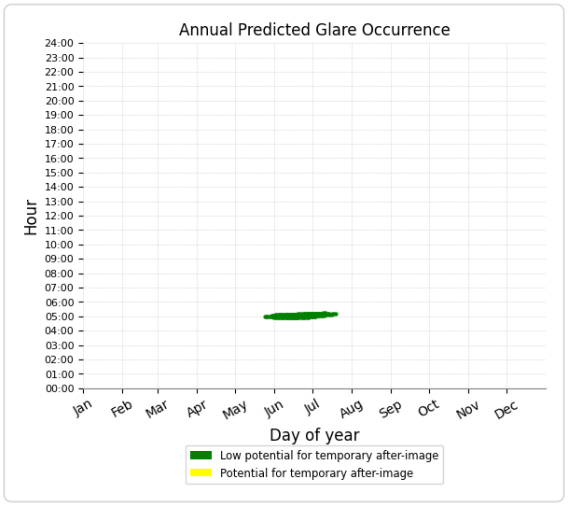


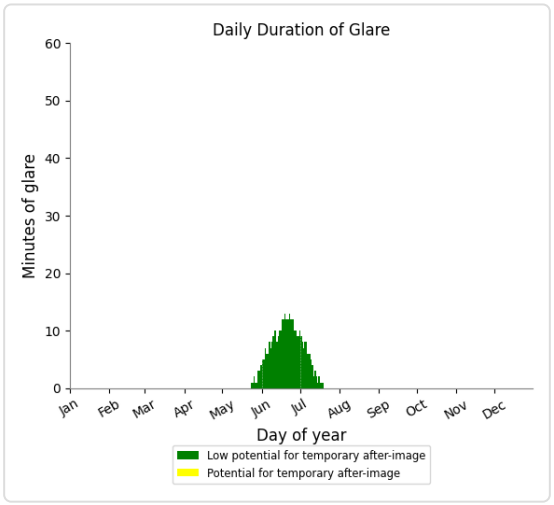


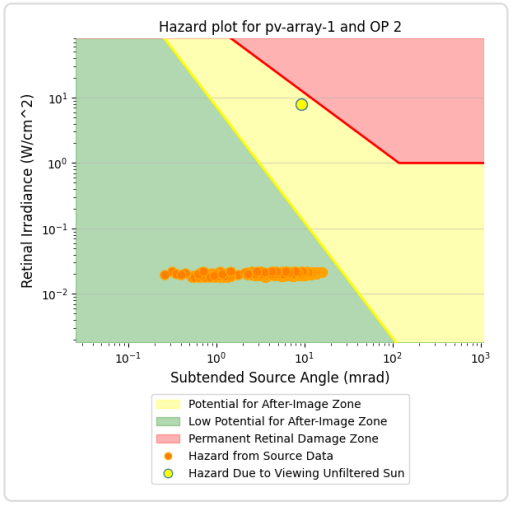
PV array 1 and OP 2

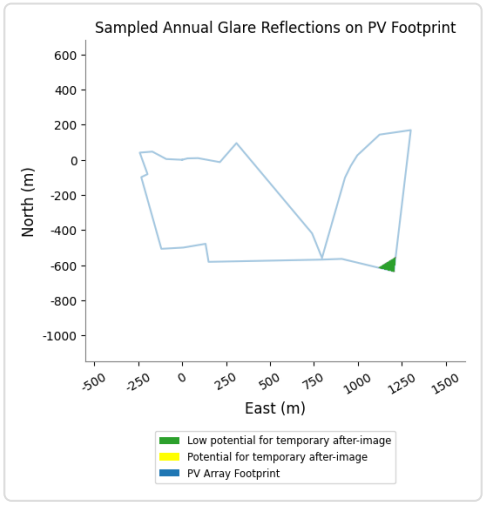
Yellow glare: none

Green glare: 388 min.





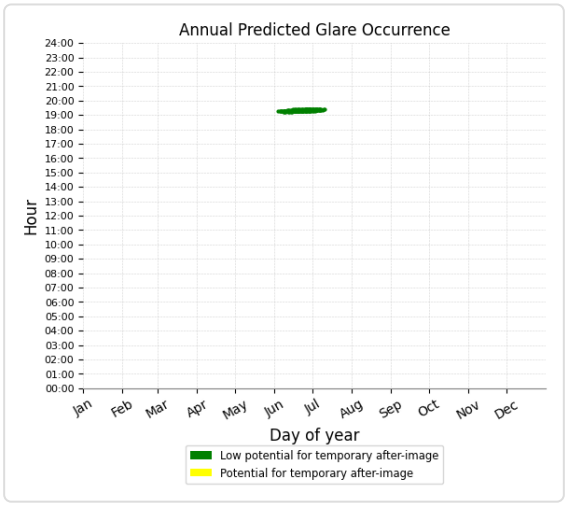


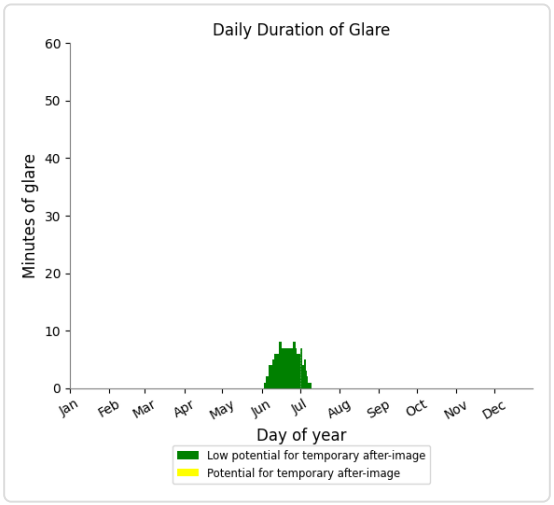


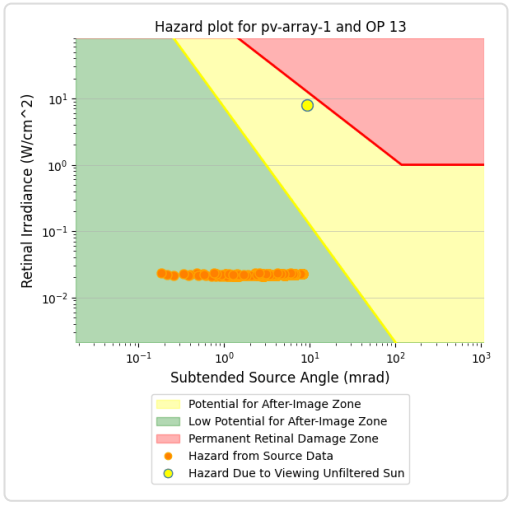
PV array 1 and OP 13

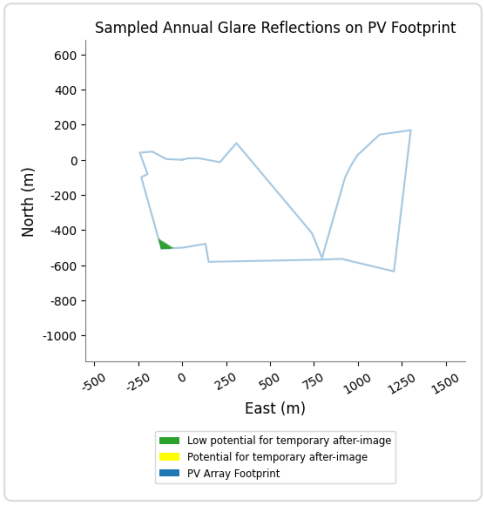
Yellow glare: none

Green glare: 195 min.



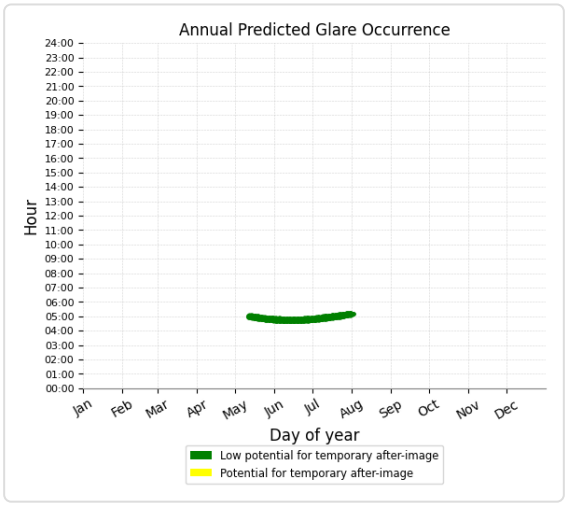


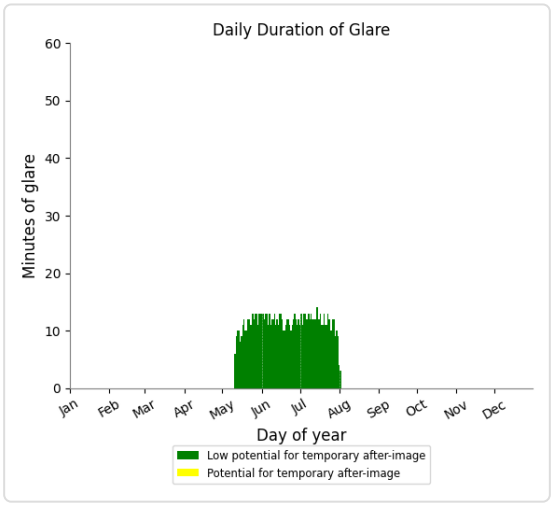


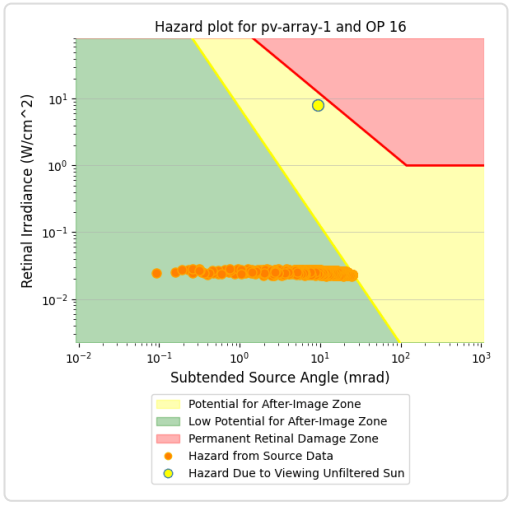


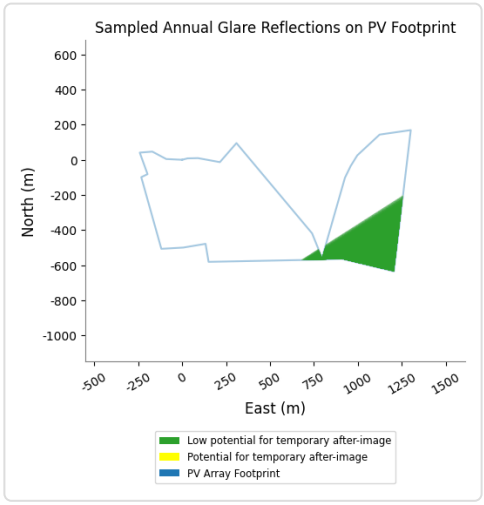
PV array 1 and OP 16

Yellow glare: none
Green glare: 957 min.









PV array 1 and OP 7

No glare found

PV array 1 and OP 8

No glare found

PV array 1 and OP 9

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 17

No glare found

PV array 1 and OP 18

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 22

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV: PV array 2 potential temporary after-image

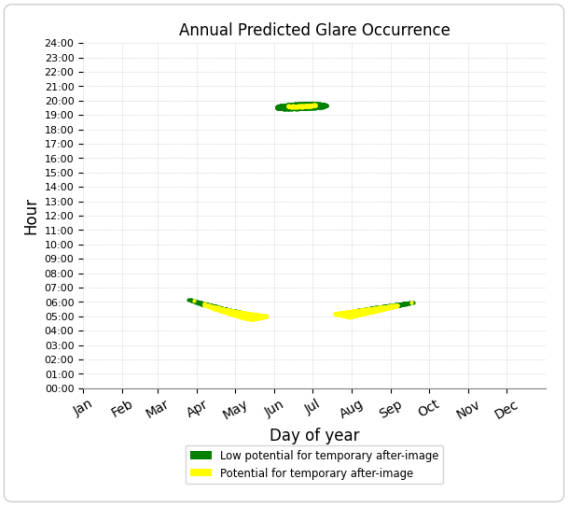
Receptor results ordered by category of glare

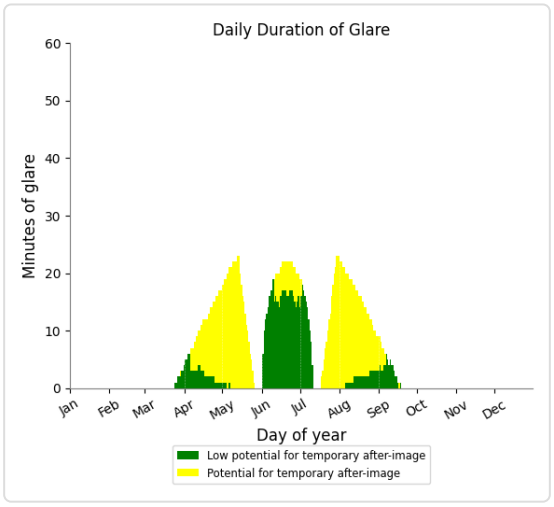
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	799	13.3	1,424	23.7
Route 3	92,943	1,549.0	106,257	1,771.0
Route 4	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 8	963	16.1	12	0.2
OP 9	1,432	23.9	149	2.5
OP 10	1,479	24.6	284	4.7
OP 14	541	9.0	1,921	32.0
OP 15	769	12.8	2,679	44.6
OP 16	624	10.4	2,028	33.8
OP 19	1,068	17.8	1,121	18.7
OP 21	1,583	26.4	148	2.5
OP 22	489	8.2	2,293	38.2
OP 23	1,083	18.1	936	15.6
OP 26	964	16.1	2,459	41.0
OP 2	687	11.4	0	0.0
OP 7	361	6.0	0	0.0
OP 13	518	8.6	0	0.0
OP 24	790	13.2	0	0.0
OP 25	637	10.6	0	0.0
OP 29	322	5.4	0	0.0
OP 1	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0

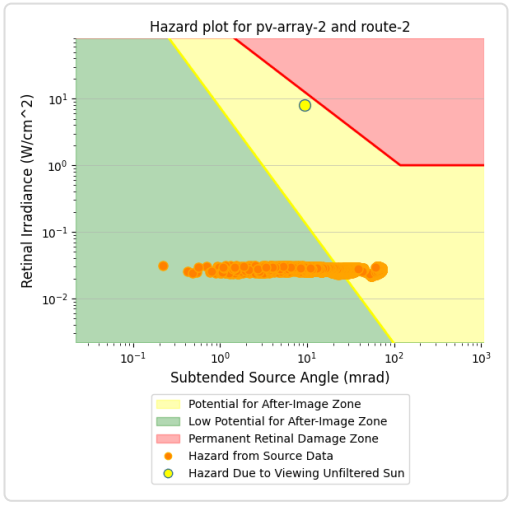
PV array 2 and Route: Route 1

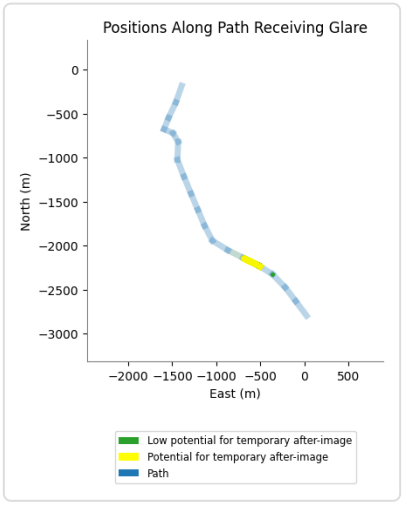
Yellow glare: 1,424 min.

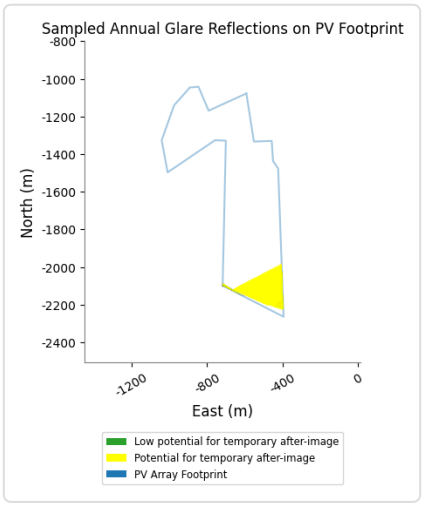
Green glare: 799 min.







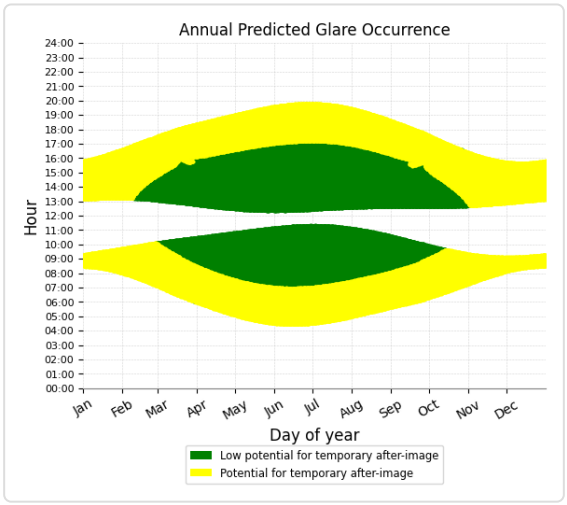


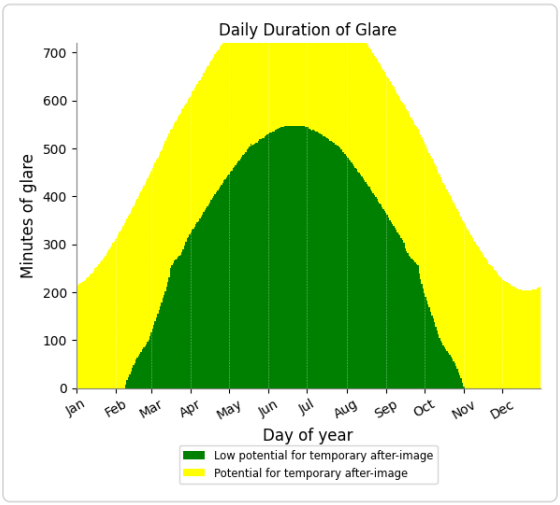


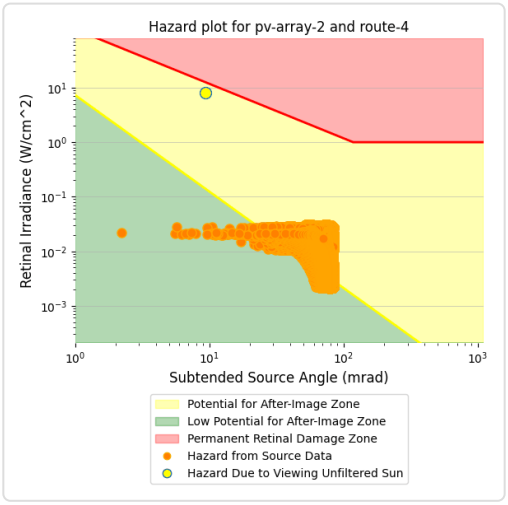
PV array 2 and Route: Route 3

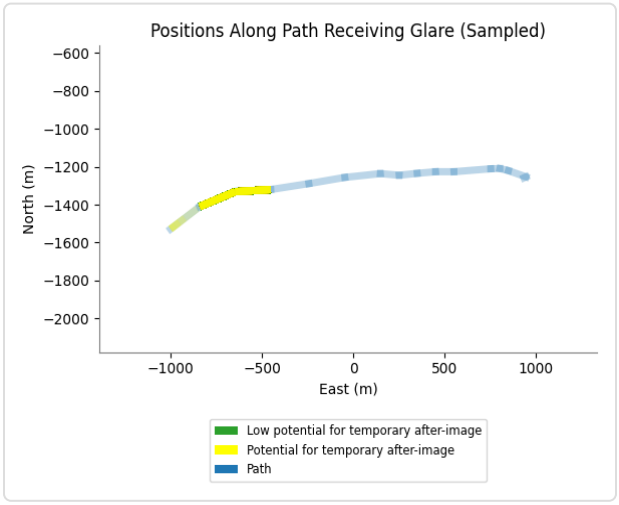
Yellow glare: 106,257 min.

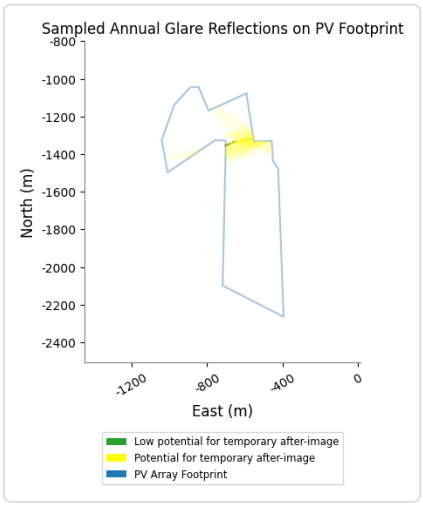
Green glare: 92,943 min.











PV array 2 and Route: Route 4

No glare found

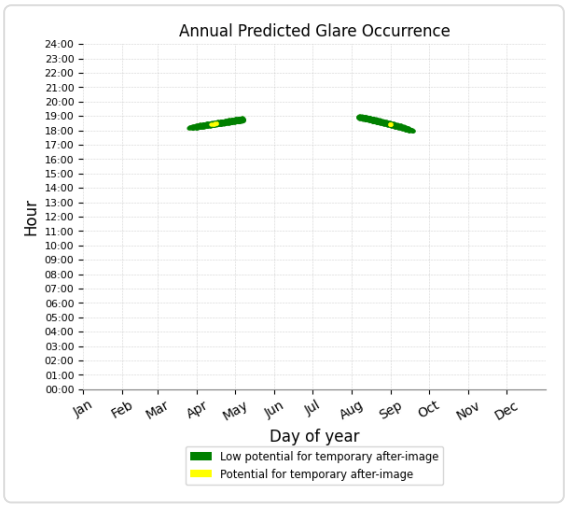
PV array 2 and Route: Route 2

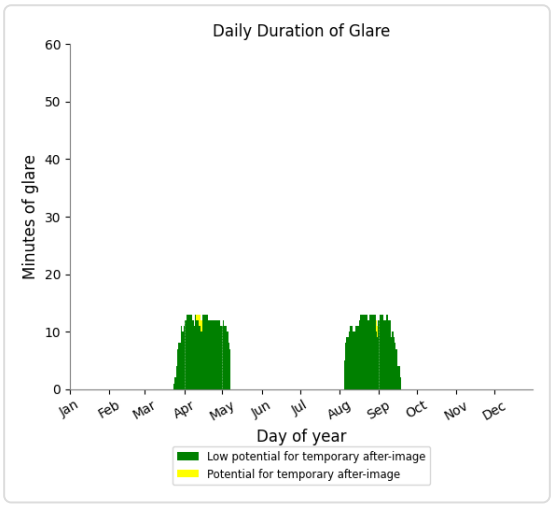
No glare found

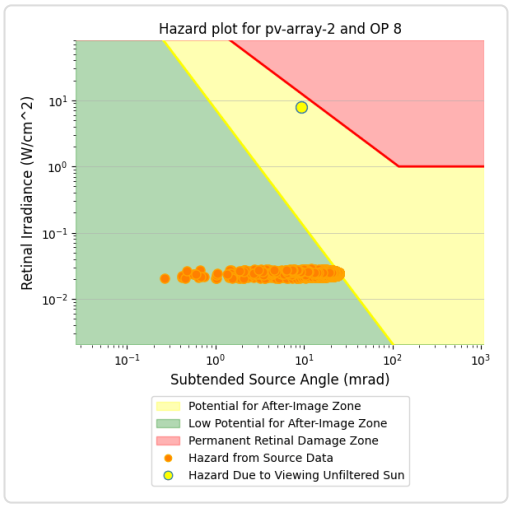
PV array 2 and OP 8

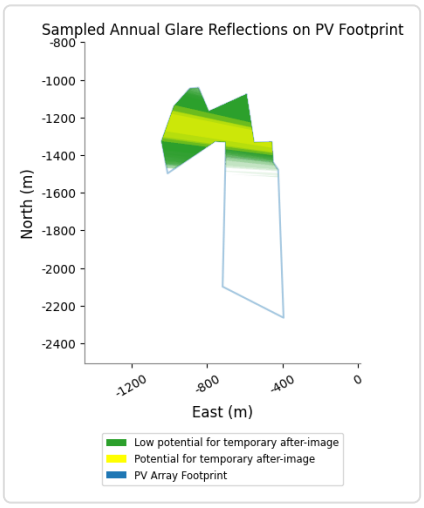
Yellow glare: 12 min.

Green glare: 963 min.





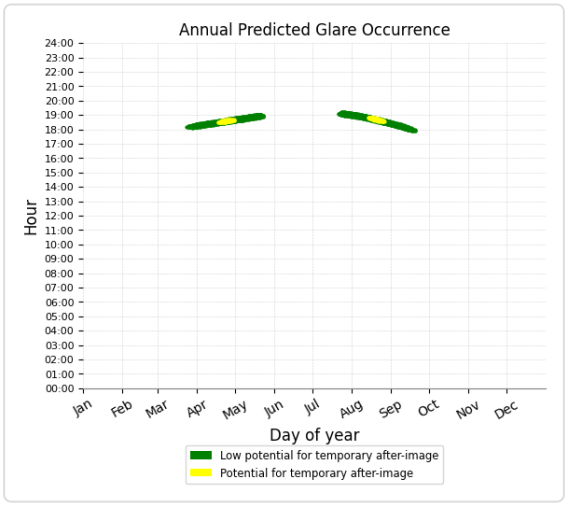


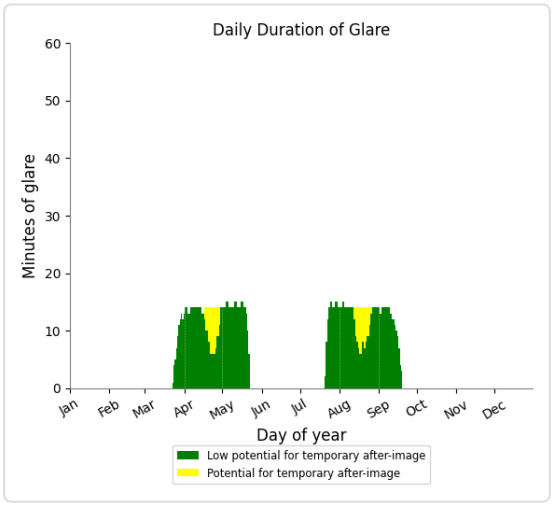


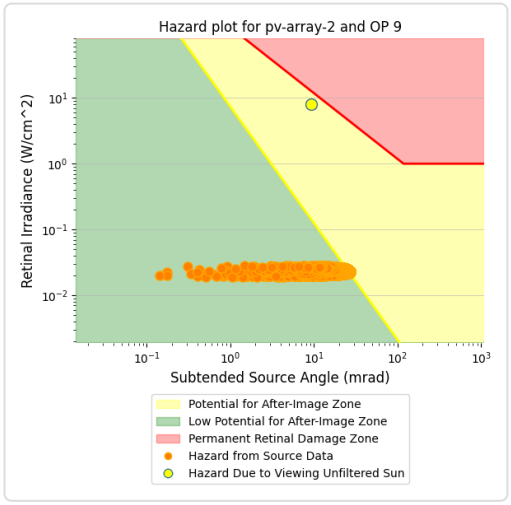
PV array 2 and OP 9

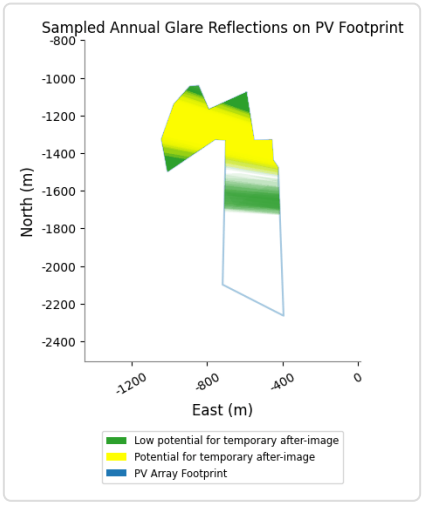
Yellow glare: 149 min.

Green glare: 1,432 min.





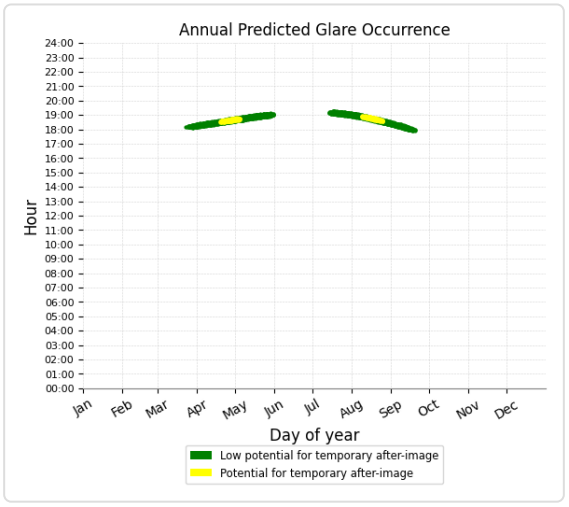


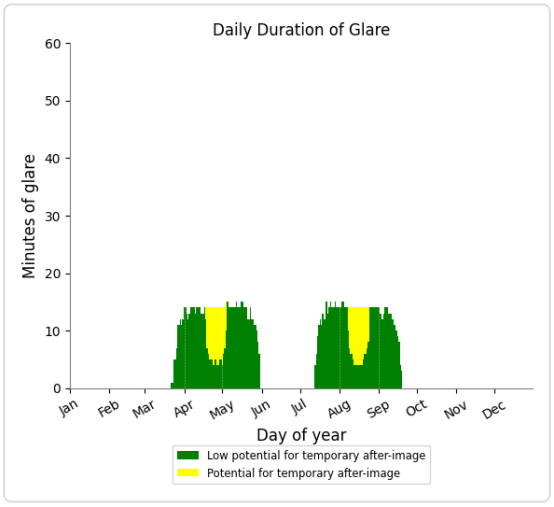


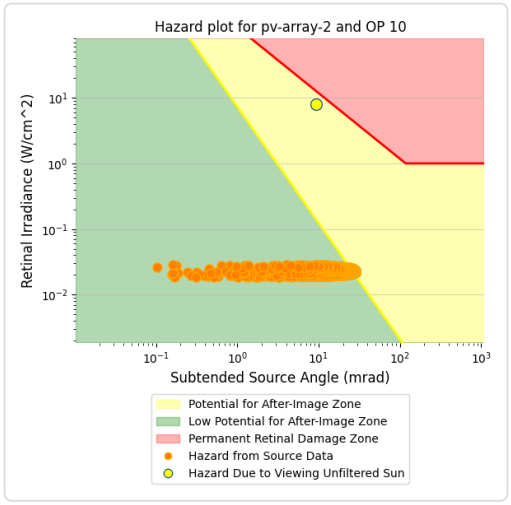
PV array 2 and OP 10

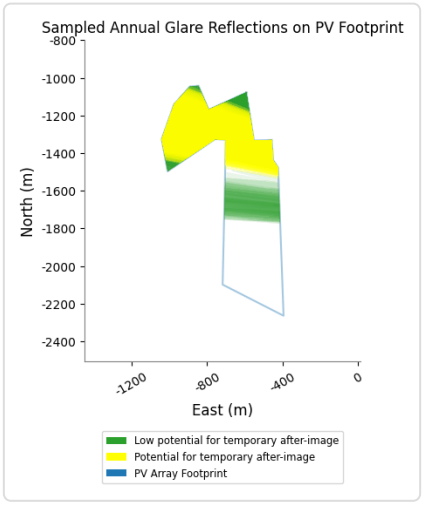
Yellow glare: 284 min.

Green glare: 1,479 min.





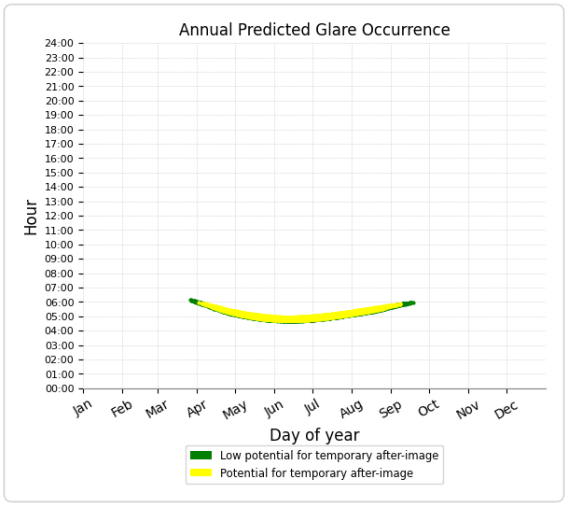


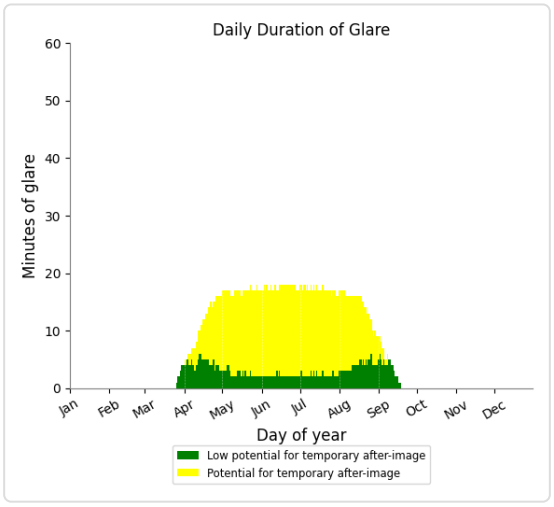


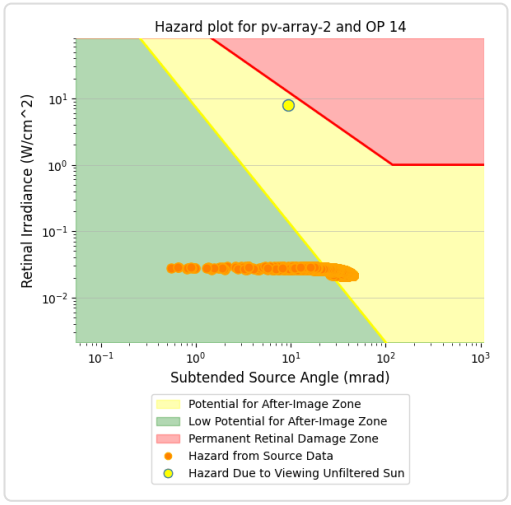
PV array 2 and OP 14

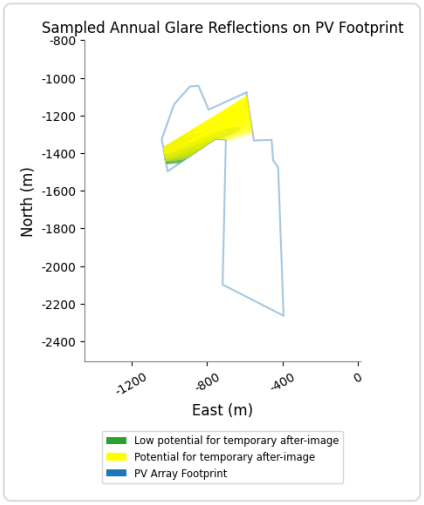
Yellow glare: 1,921 min.

Green glare: 541 min.





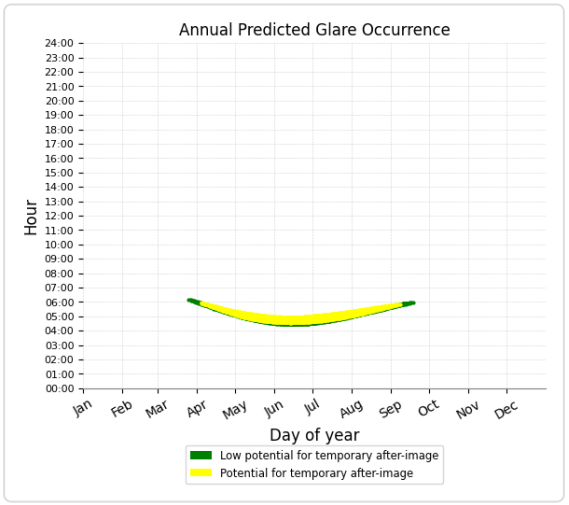


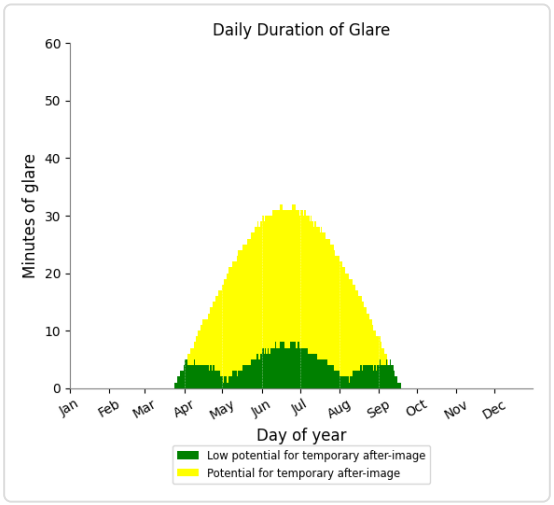


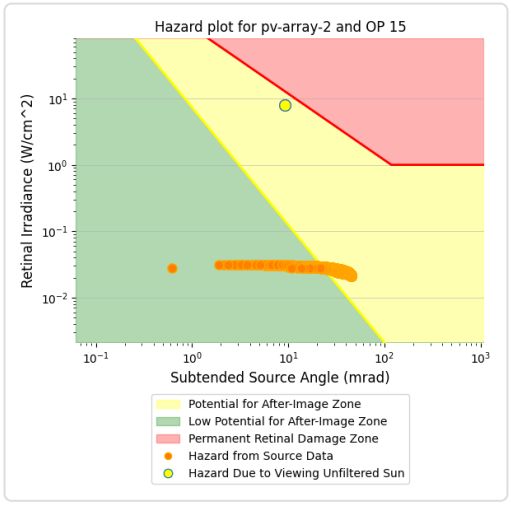
PV array 2 and OP 15

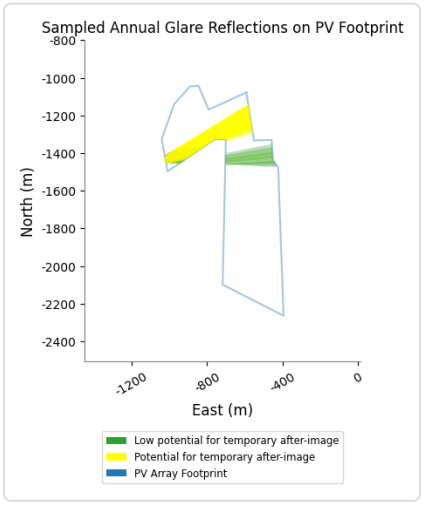
Yellow glare: 2,679 min.

Green glare: 769 min.





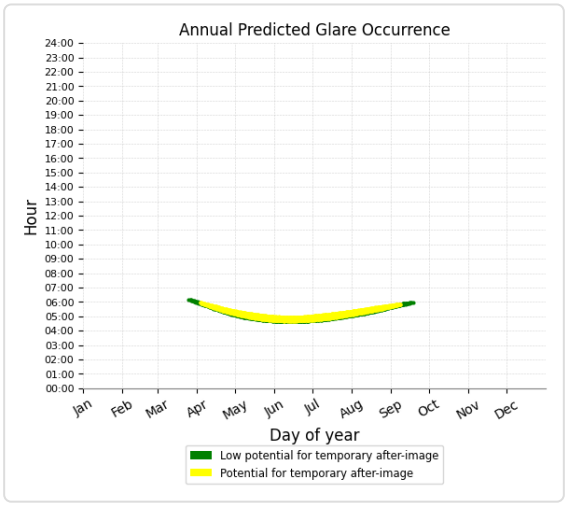


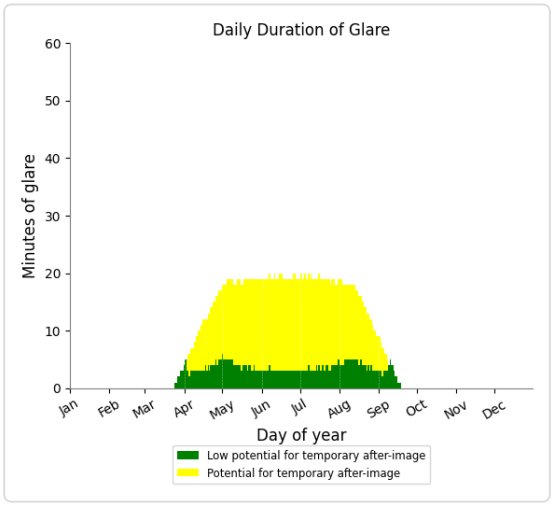


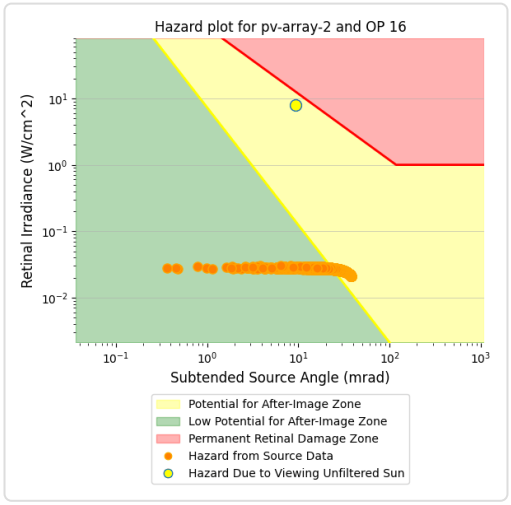
PV array 2 and OP 16

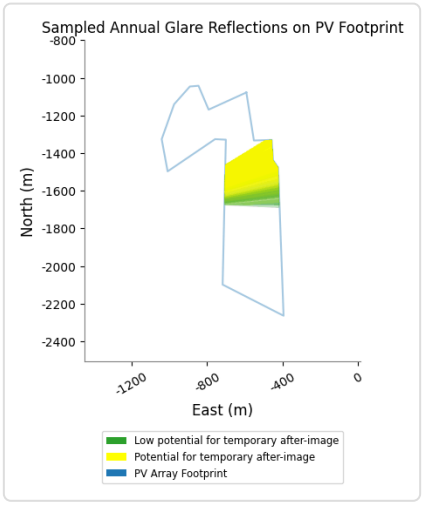
Yellow glare: 2,028 min.

Green glare: 624 min.





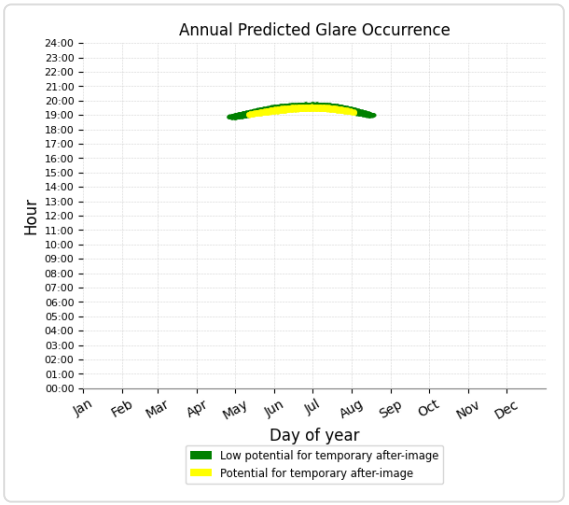


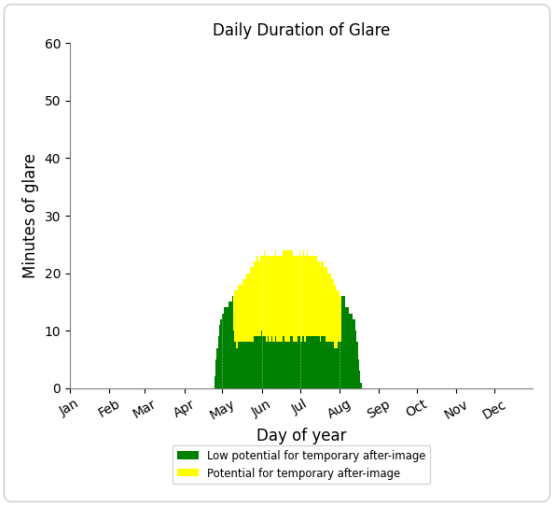


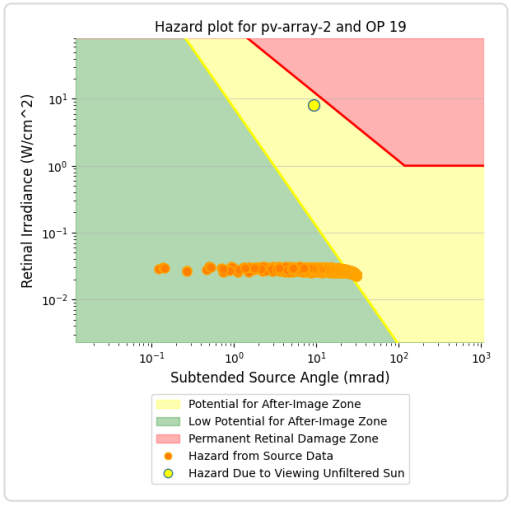
PV array 2 and OP 19

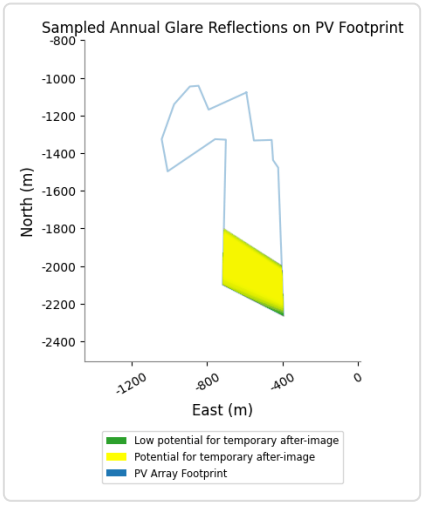
Yellow glare: 1,121 min.

Green glare: 1,068 min.





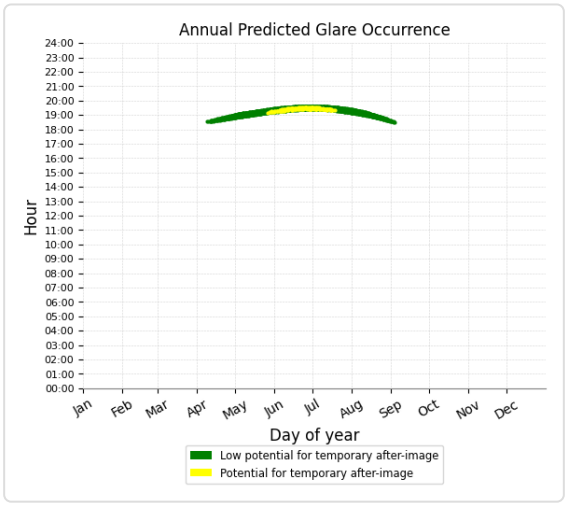


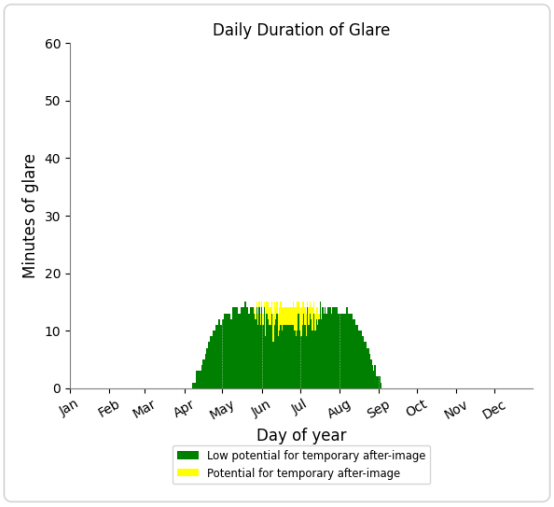


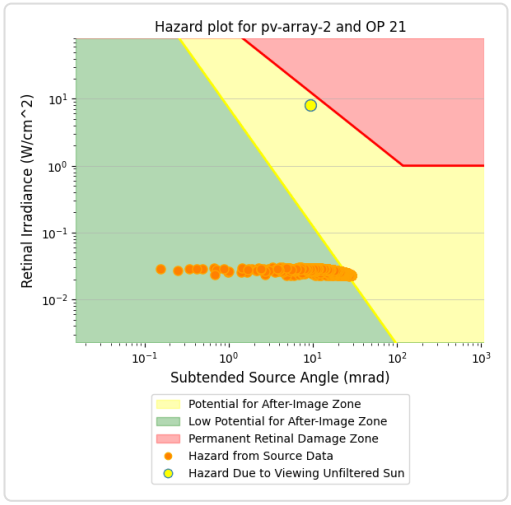
PV array 2 and OP 21

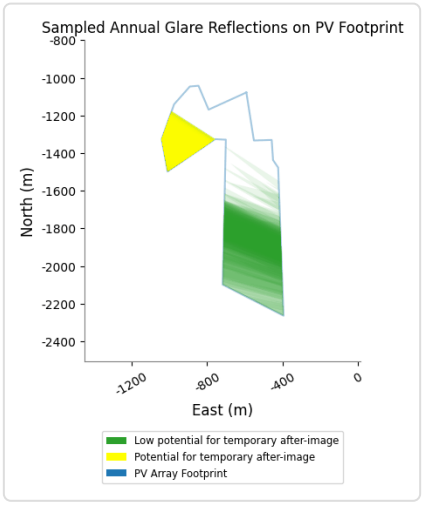
Yellow glare: 148 min.

Green glare: 1,583 min.





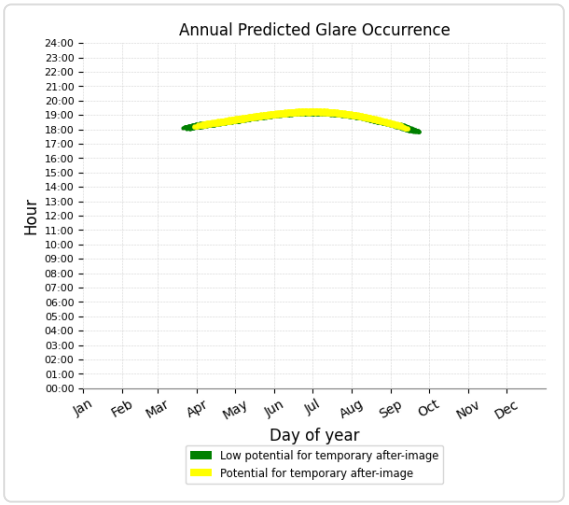


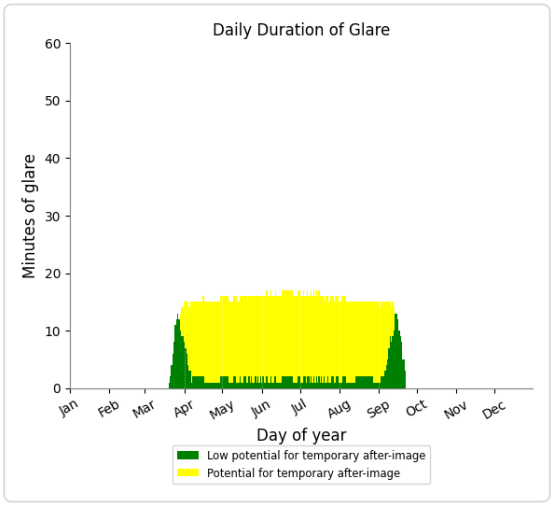


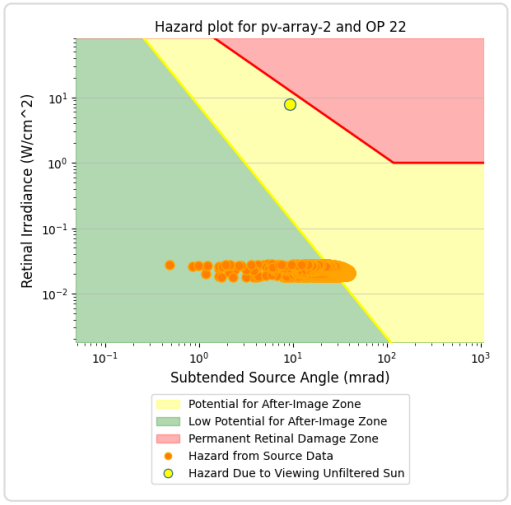
PV array 2 and OP 22

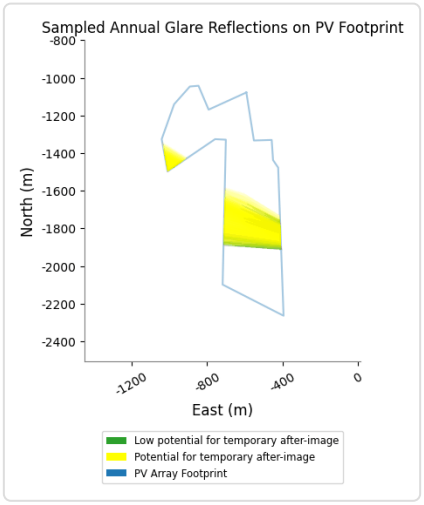
Yellow glare: 2,293 min.

Green glare: 489 min.





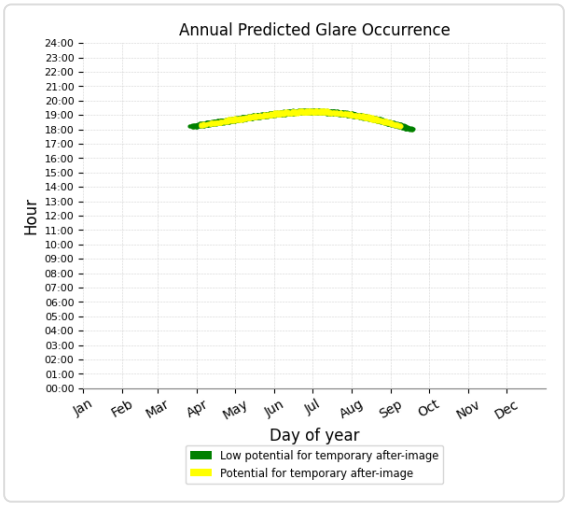


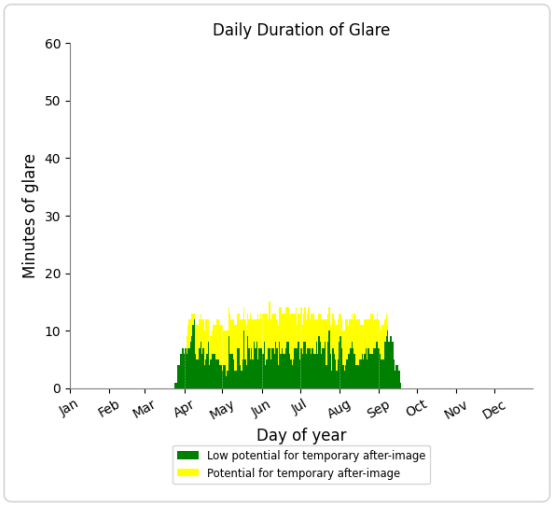


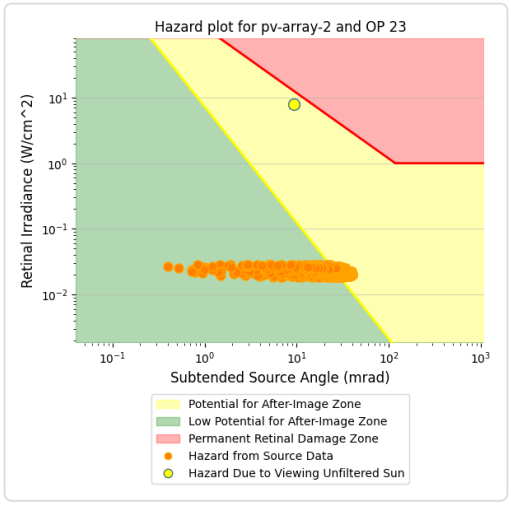
PV array 2 and OP 23

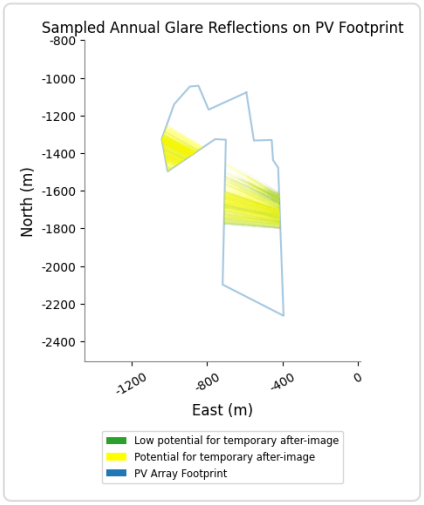
Yellow glare: 936 min.

Green glare: 1,083 min.





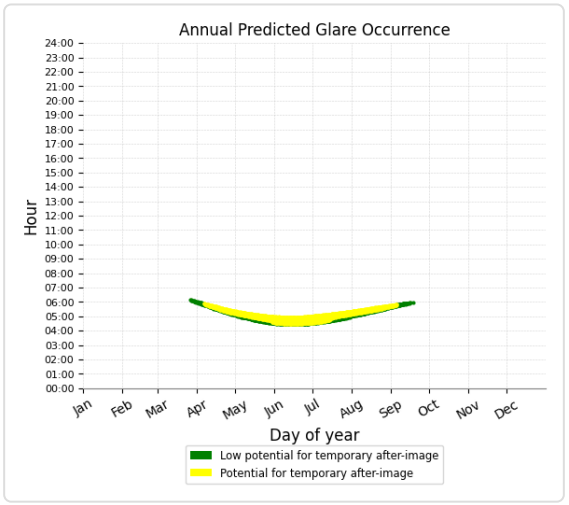


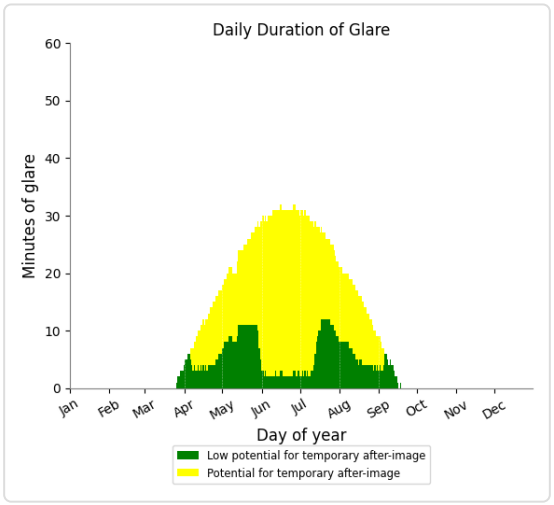


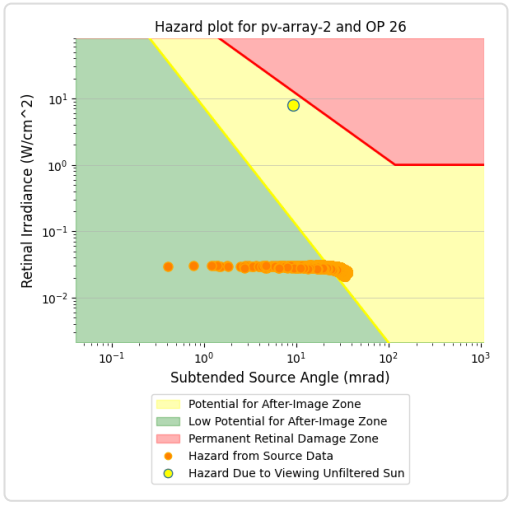
PV array 2 and OP 26

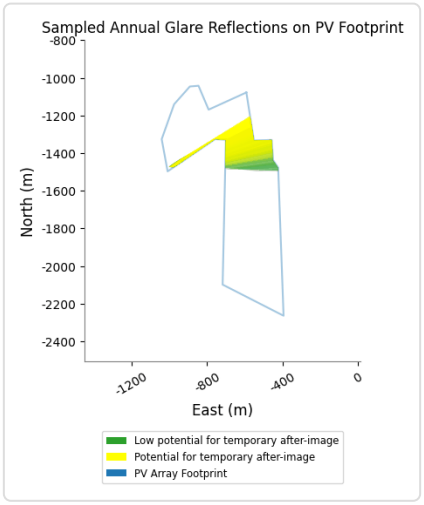
Yellow glare: 2,459 min.

Green glare: 964 min.





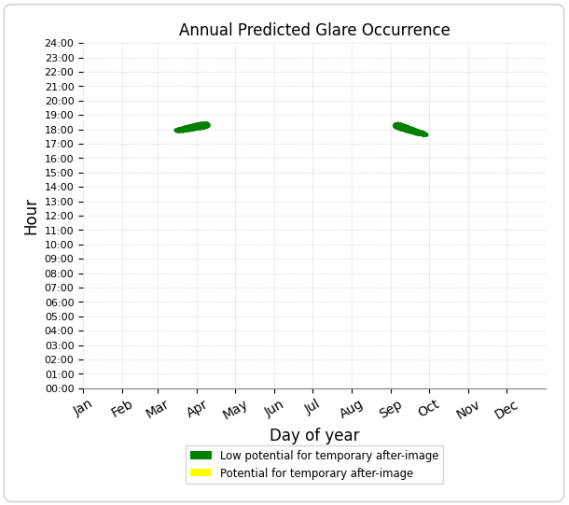


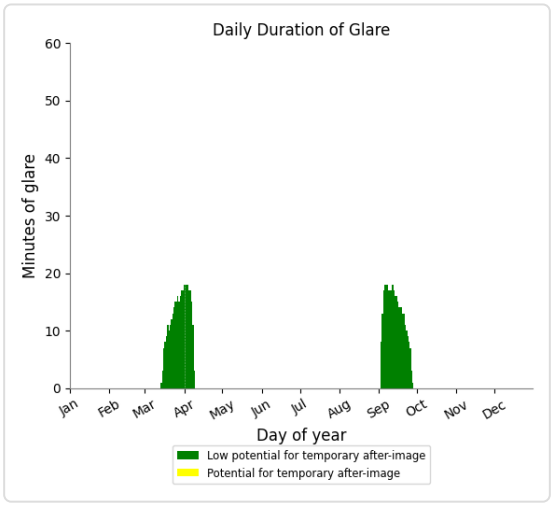


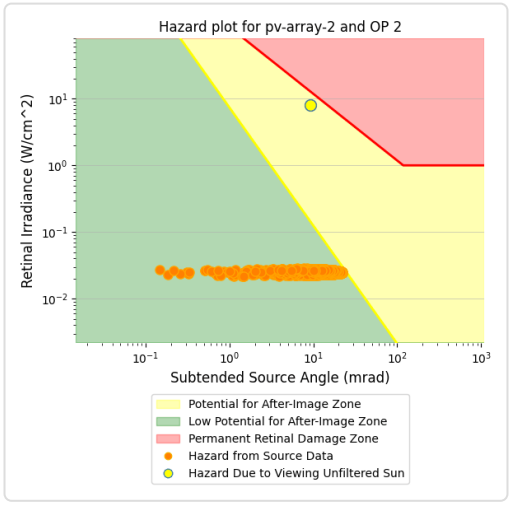
PV array 2 and OP 2

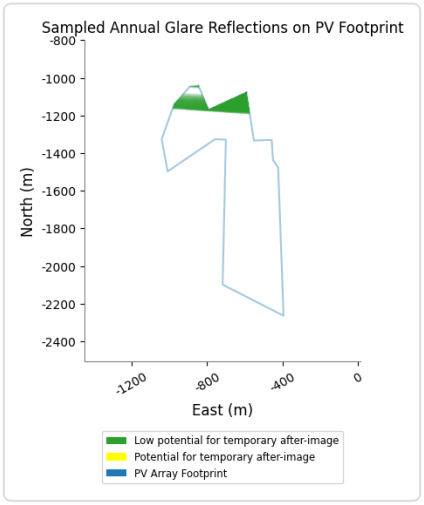
Yellow glare: none

Green glare: 687 min.





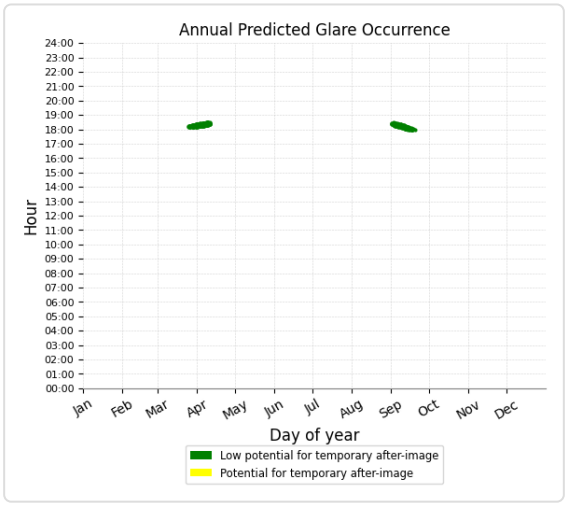


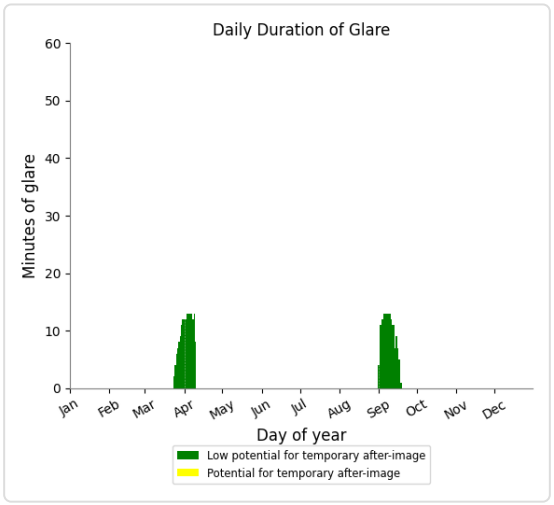


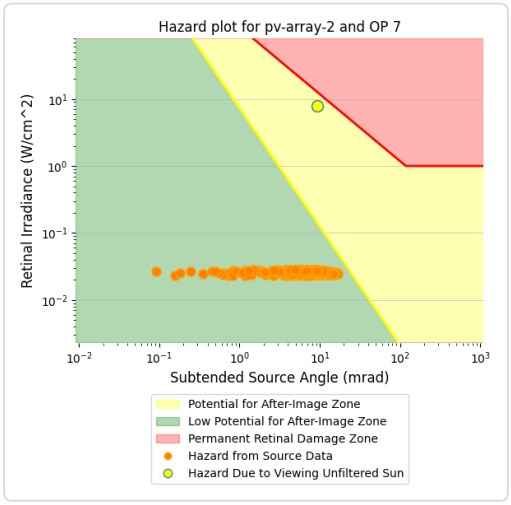
PV array 2 and OP 7

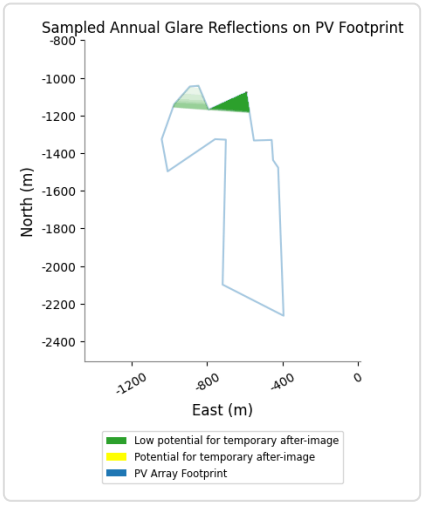
Yellow glare: none

Green glare: 361 min.





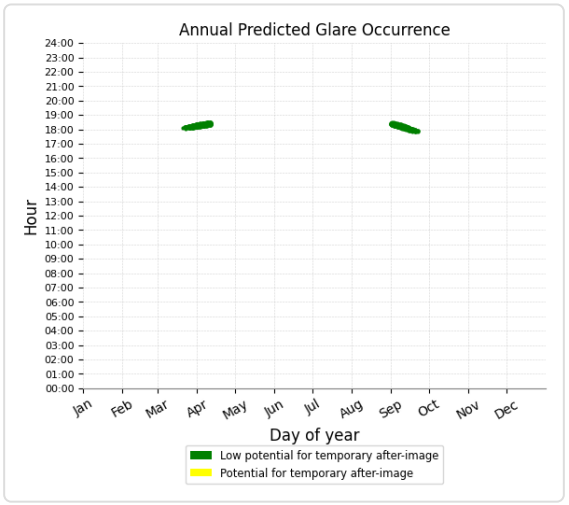


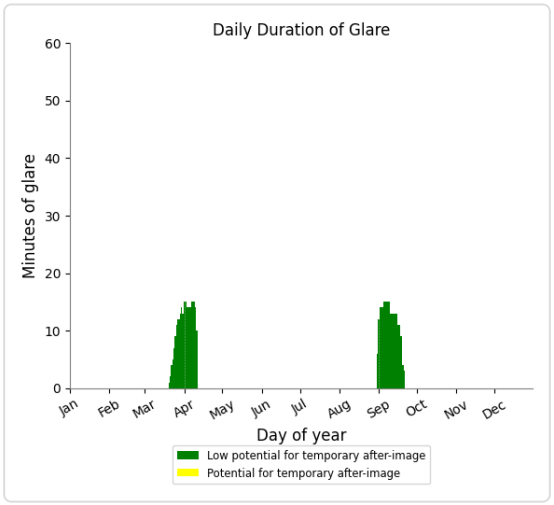


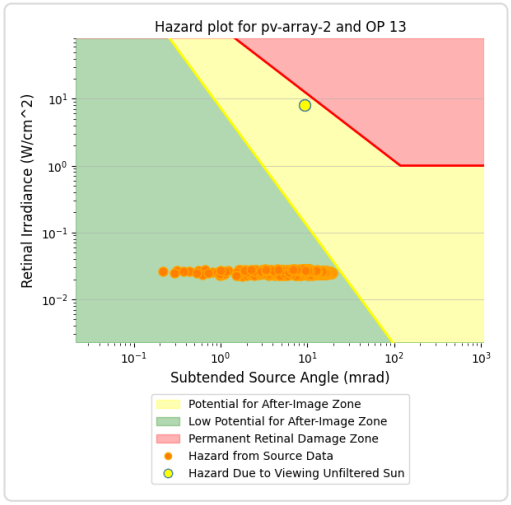
PV array 2 and OP 13

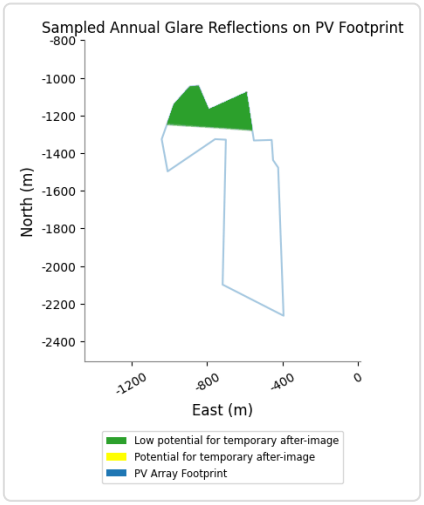
Yellow glare: none

Green glare: 518 min.





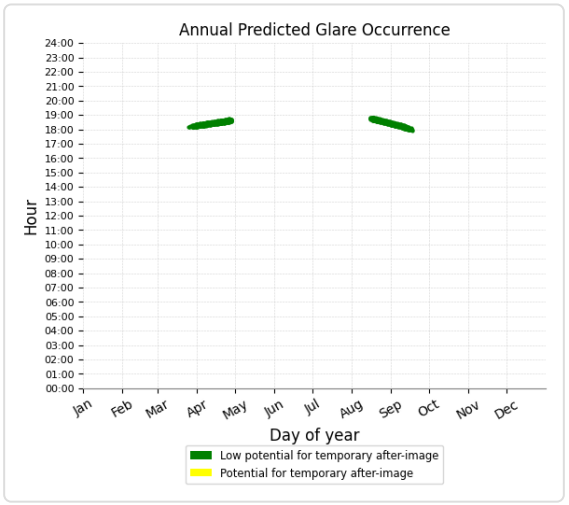


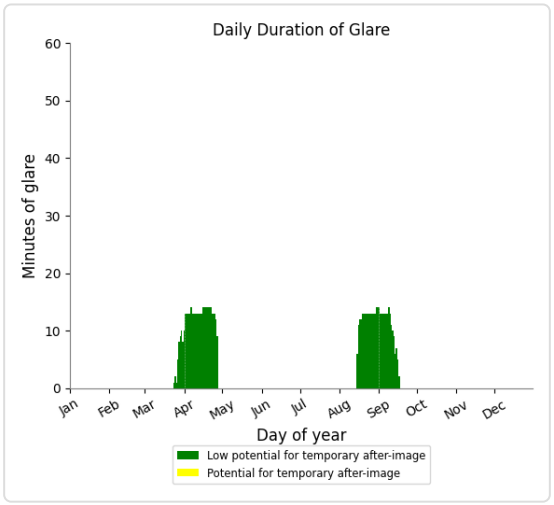


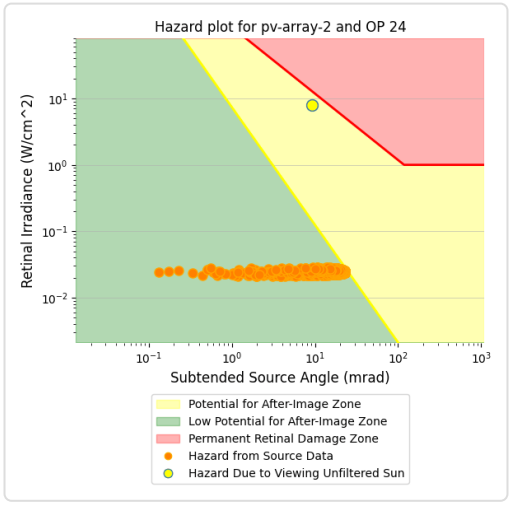
PV array 2 and OP 24

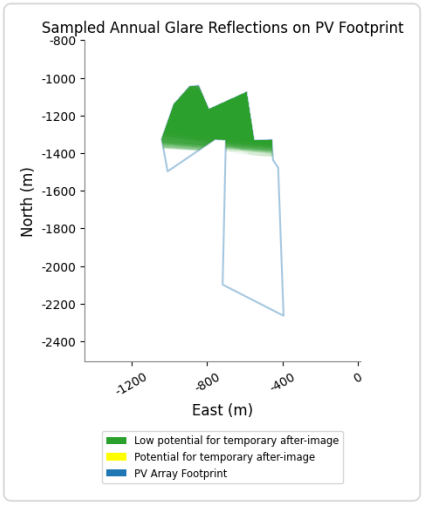
Yellow glare: none

Green glare: 790 min.





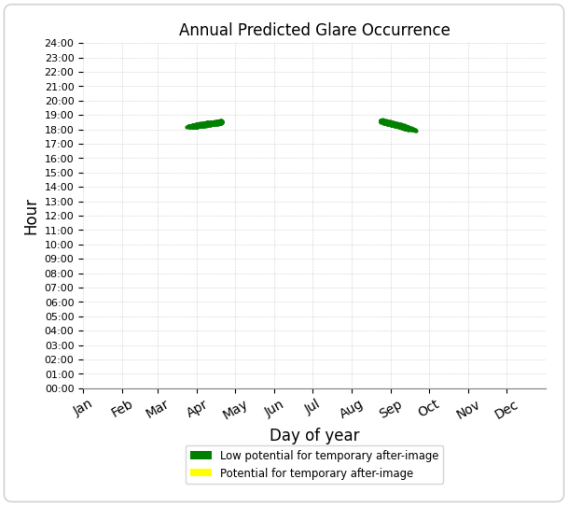


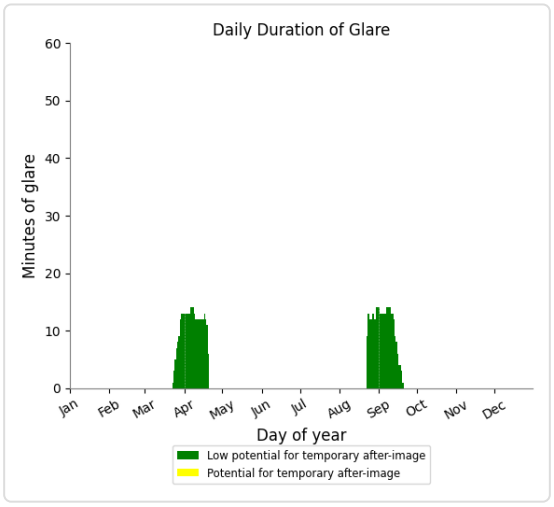


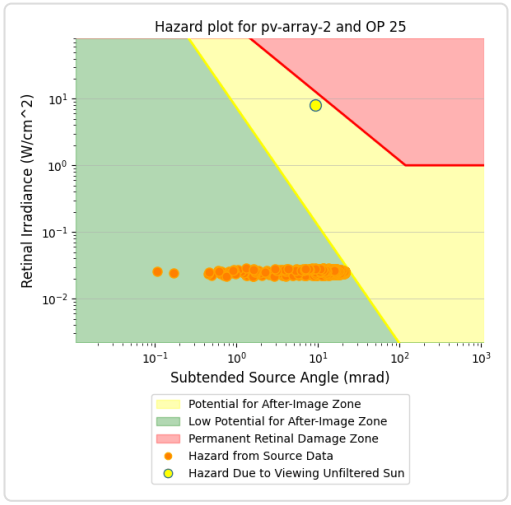
PV array 2 and OP 25

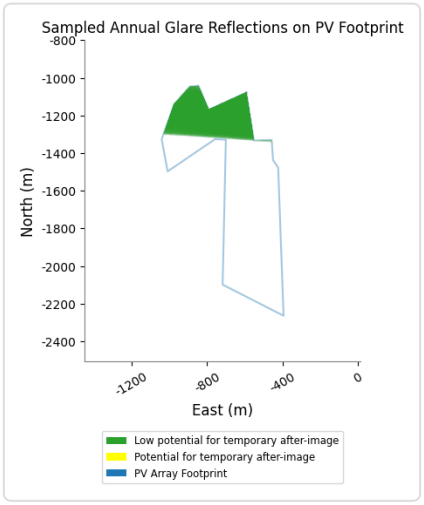
Yellow glare: none

Green glare: 637 min.





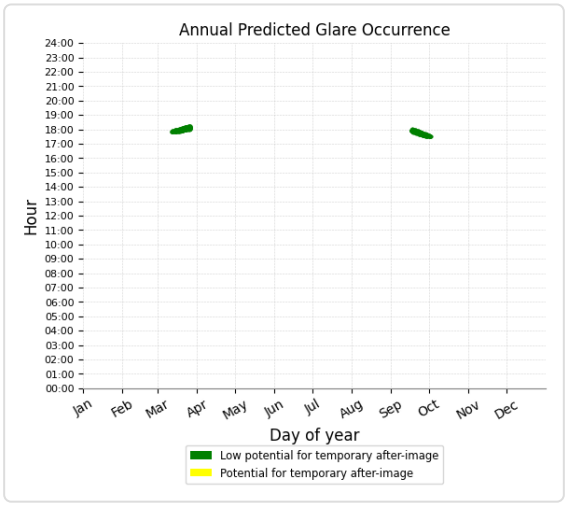


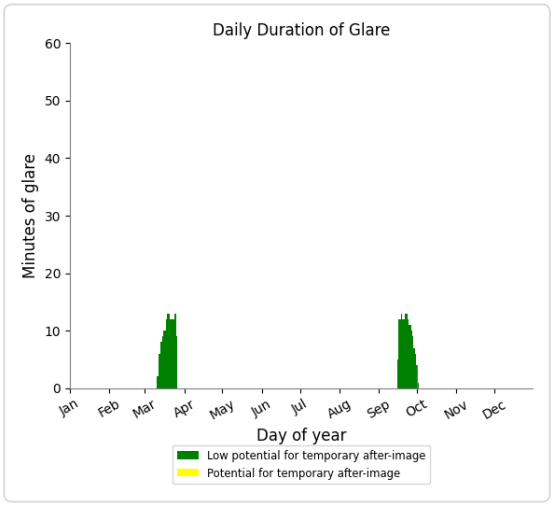


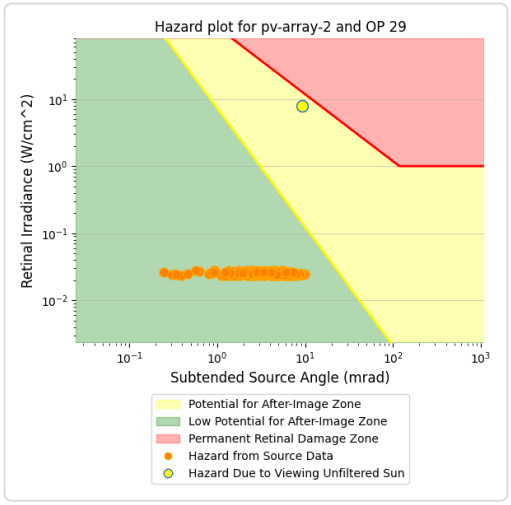
PV array 2 and OP 29

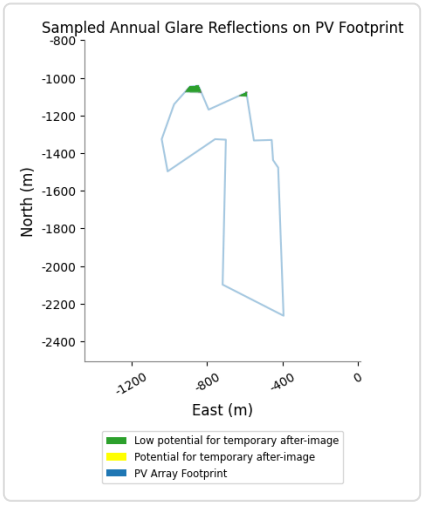
Yellow glare: none

Green glare: 322 min.









PV array 2 and OP 1

No glare found

PV array 2 and OP 3

No glare found

PV array 2 and OP 4

No glare found

PV array 2 and OP 5

No glare found

PV array 2 and OP 6

No glare found

PV array 2 and OP 11

No glare found

PV array 2 and OP 12

No glare found

PV array 2 and OP 17

No glare found

PV array 2 and OP 18

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 27

No glare found

PV array 2 and OP 28

No glare found

PV: PV array 3 potential temporary after-image

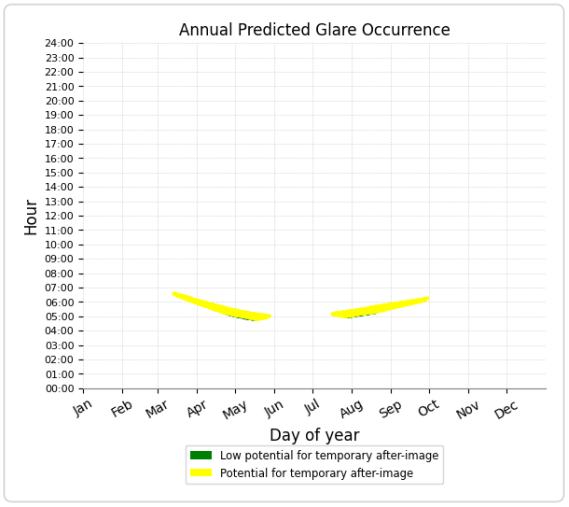
Receptor results ordered by category of glare

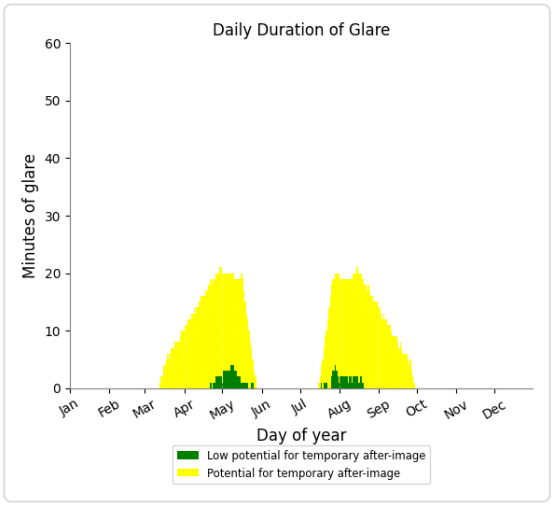
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	118	2.0	1,908	31.8
Route 4	442	7.4	1,780	29.7
Route 3	2,346	39.1	1,838	30.6
Route 2	475	7.9	2,082	34.7
OP 7	2,298	38.3	3,409	56.8
OP 8	1,255	20.9	3,183	53.0
OP 9	1,789	29.8	3,862	64.4
OP 10	1,787	29.8	4,159	69.3
OP 13	1,286	21.4	415	6.9
OP 16	1,084	18.1	296	4.9
OP 17	840	14.0	433	7.2
OP 19	663	11.1	2,592	43.2
OP 21	1,827	30.4	2,781	46.4
OP 22	426	7.1	3,181	53.0
OP 23	648	10.8	3,314	55.2
OP 24	1,059	17.6	3,256	54.3
OP 25	1,487	24.8	3,373	56.2
OP 26	653	10.9	29	0.5
OP 14	522	8.7	0	0.0
OP 15	572	9.5	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

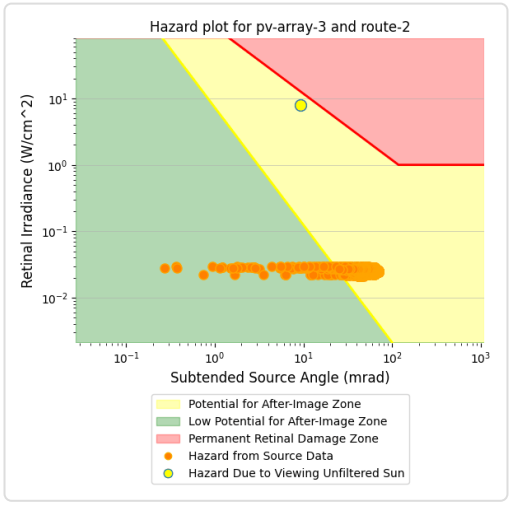
PV array 3 and Route: Route 1

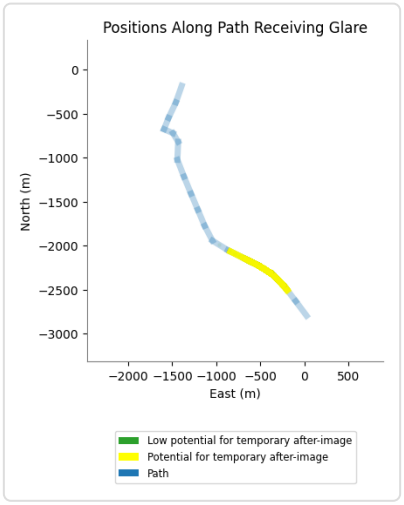
Yellow glare: 1,908 min.

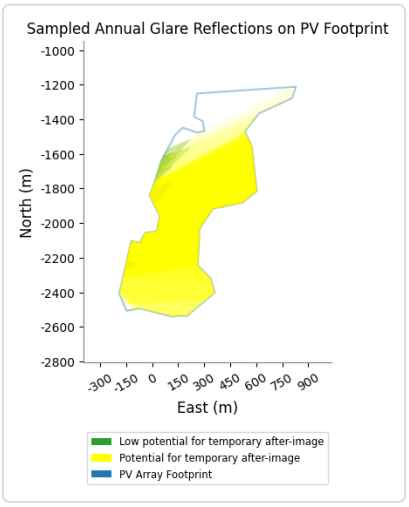
Green glare: 118 min.







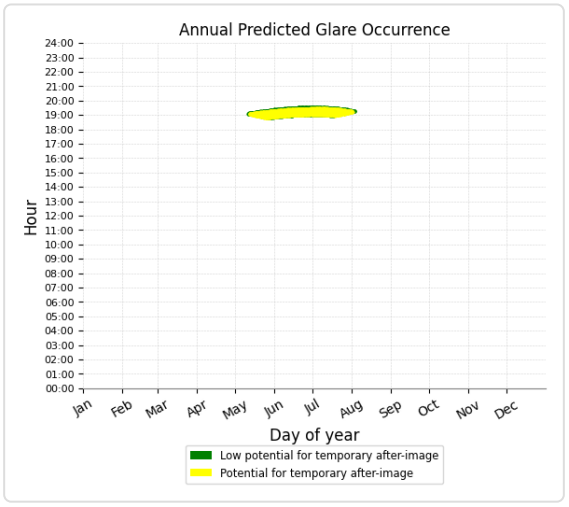


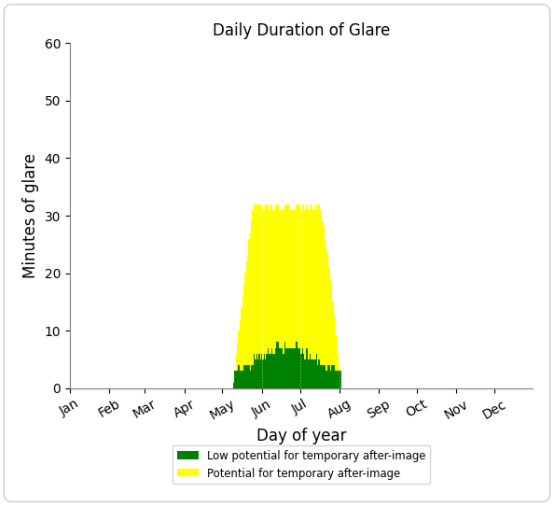


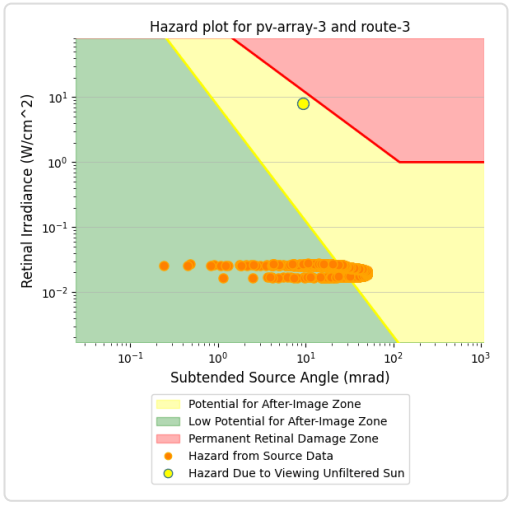
PV array 3 and Route: Route 4

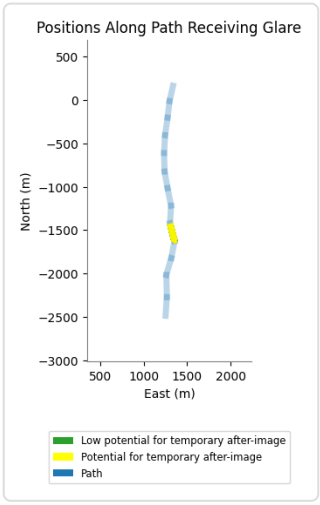
Yellow glare: 1,780 min.

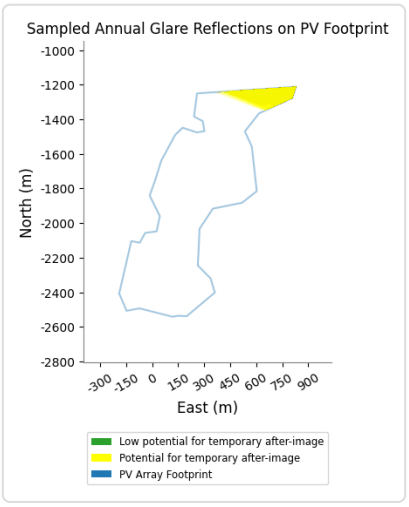
Green glare: 442 min.







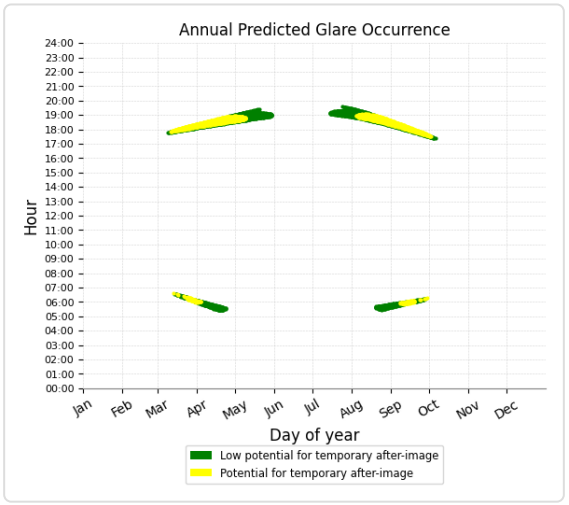


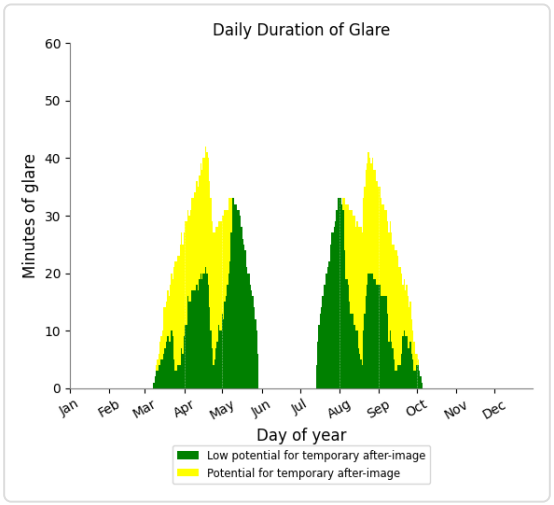


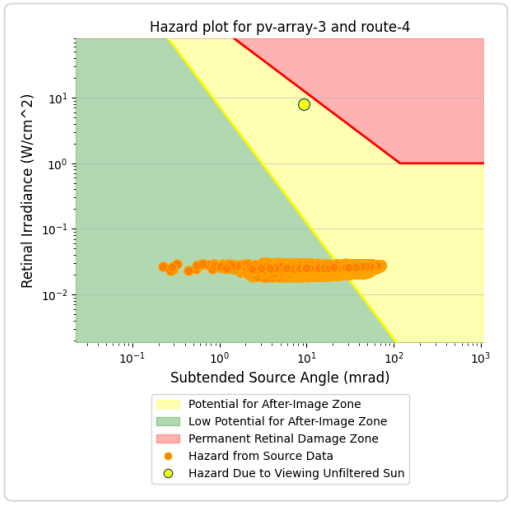
PV array 3 and Route: Route 3

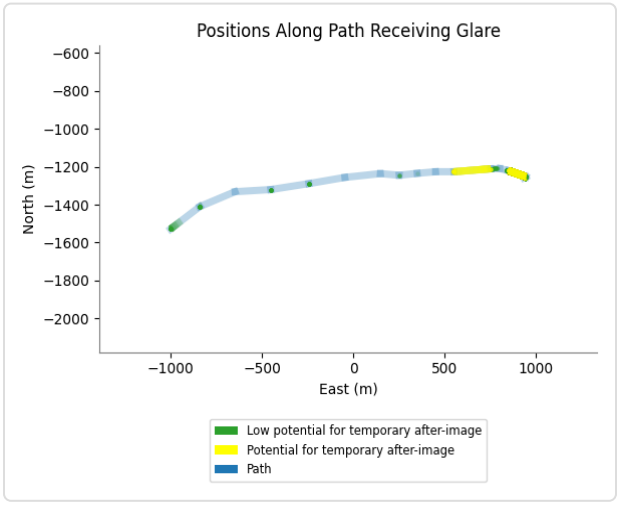
Yellow glare: 1,838 min.

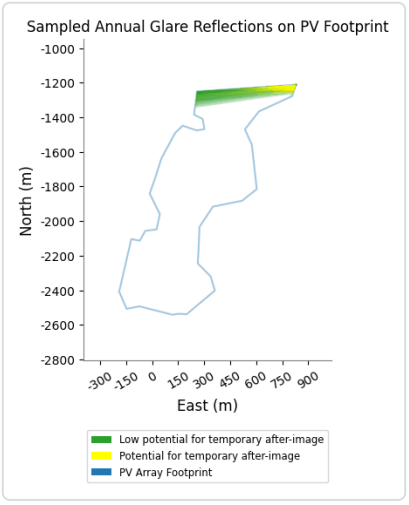
Green glare: 2,346 min.







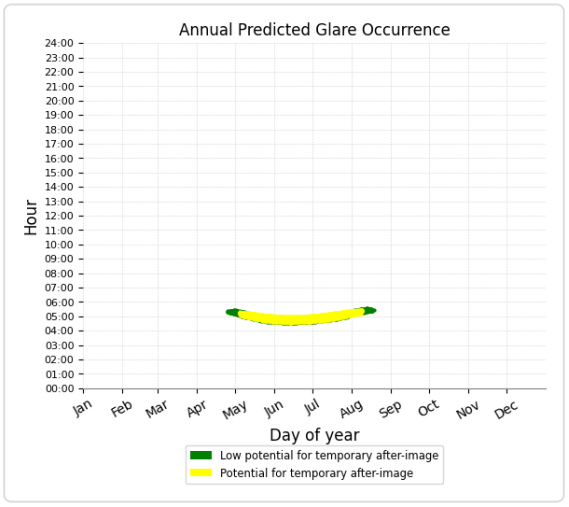


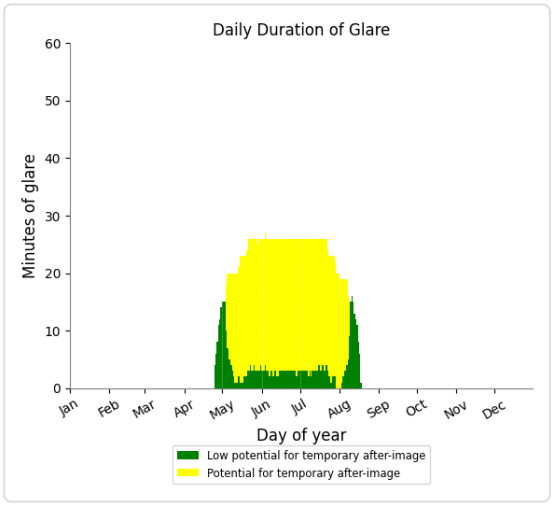


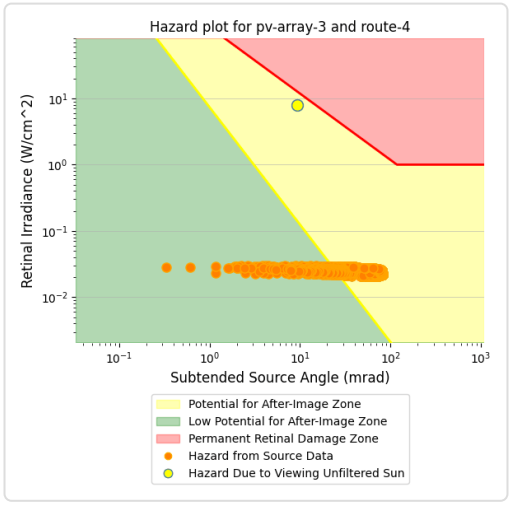
PV array 3 and Route: Route 2

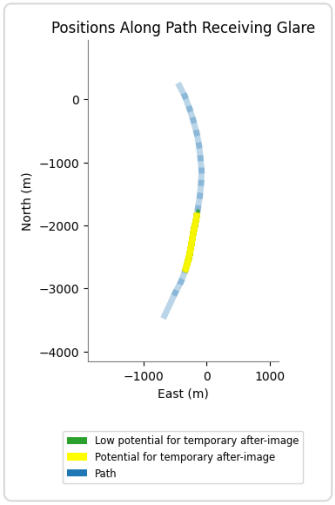
Yellow glare: 2,082 min.

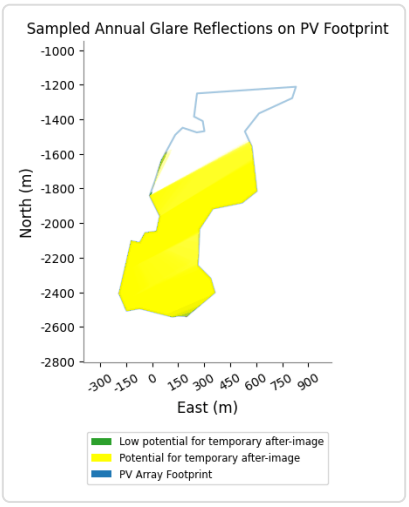
Green glare: 475 min.







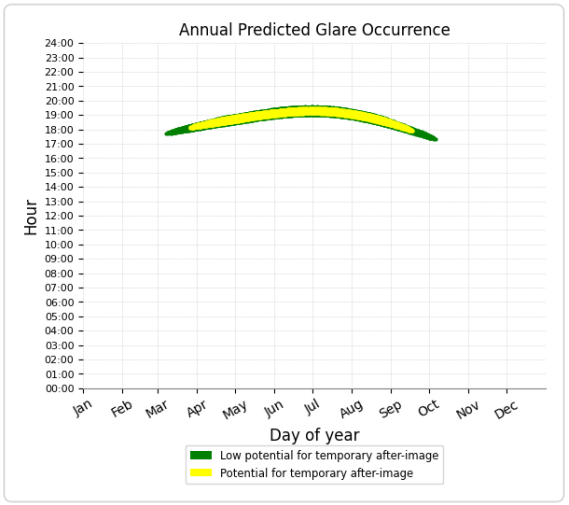


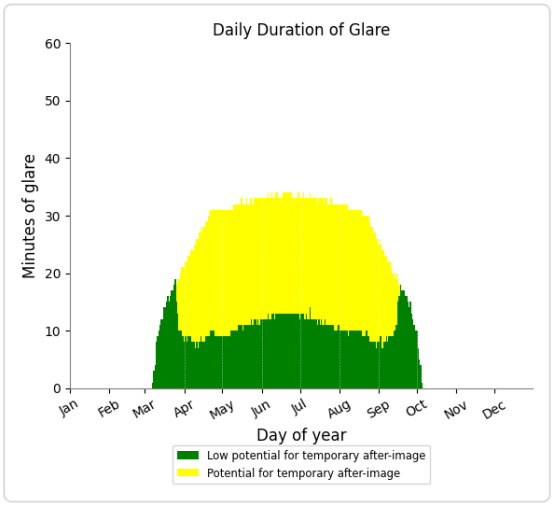


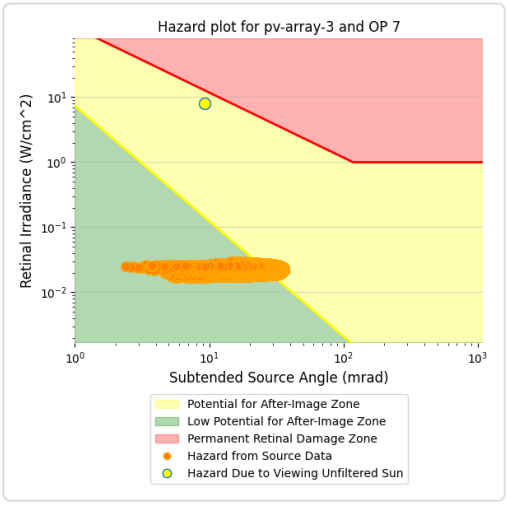
PV array 3 and OP 7

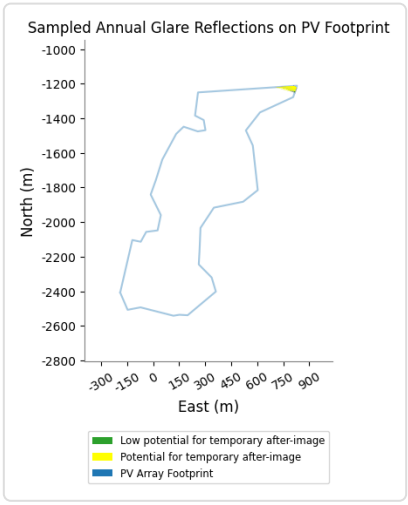
Yellow glare: 3,409 min.

Green glare: 2,298 min.





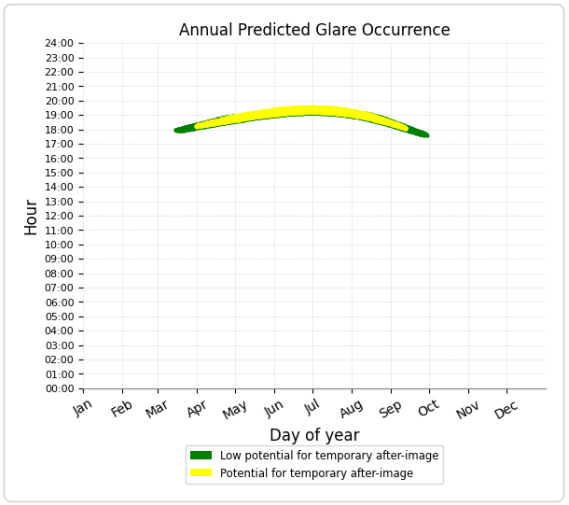


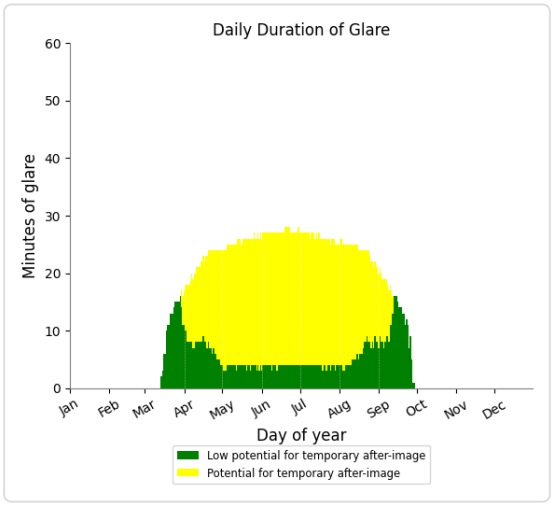


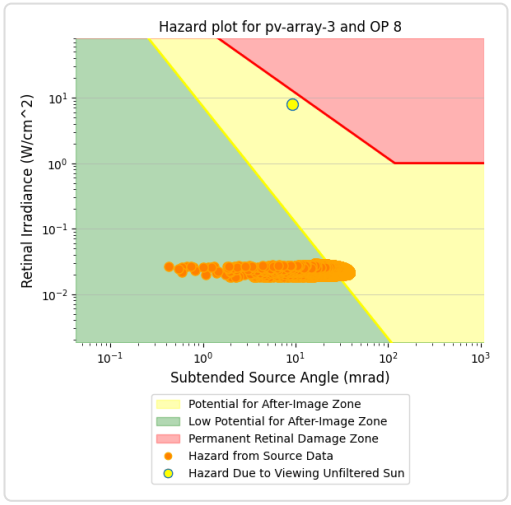
PV array 3 and OP 8

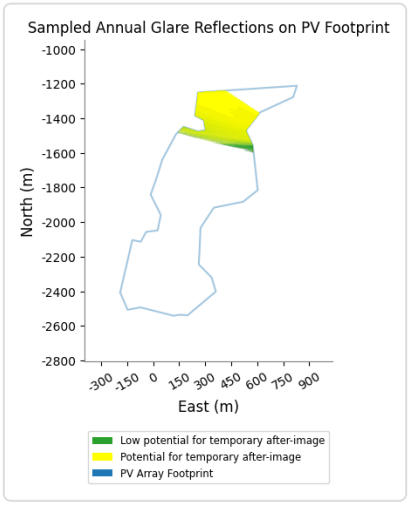
Yellow glare: 3,183 min.

Green glare: 1,255 min.





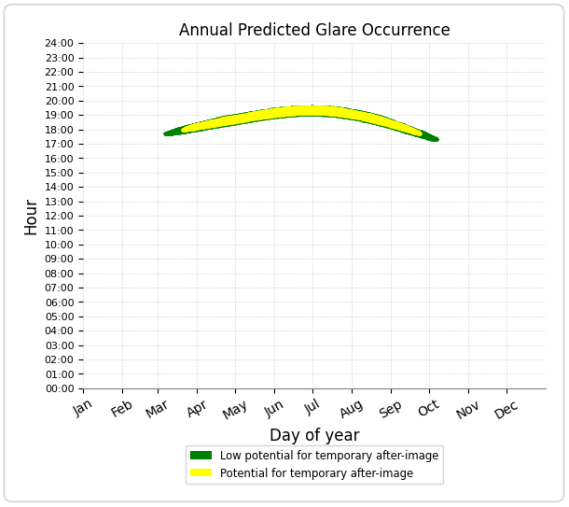


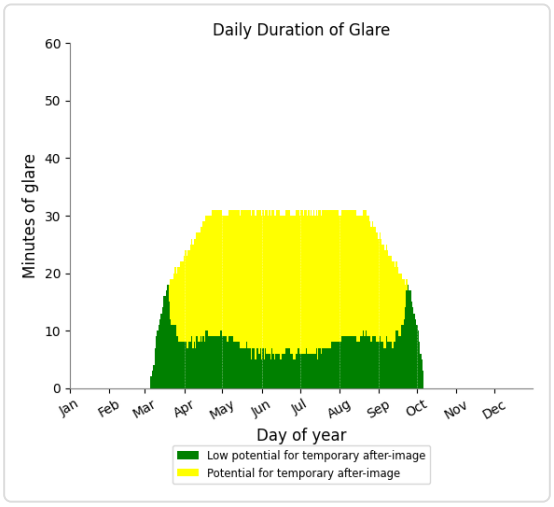


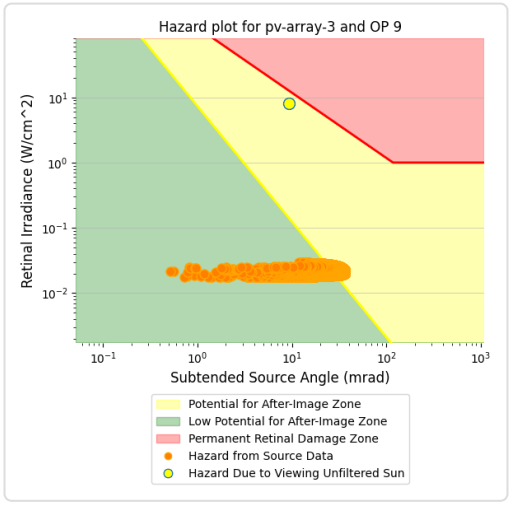
PV array 3 and OP 9

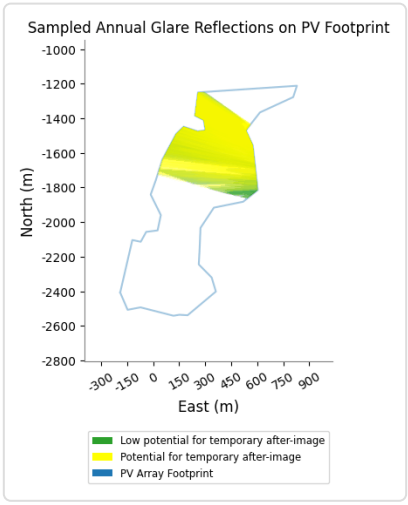
Yellow glare: 3,862 min.

Green glare: 1,789 min.





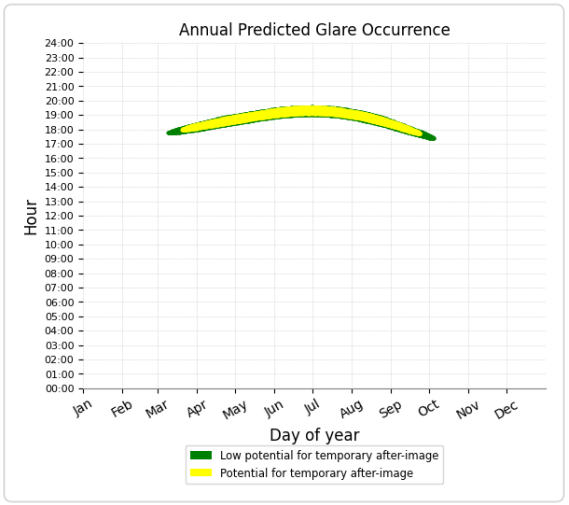


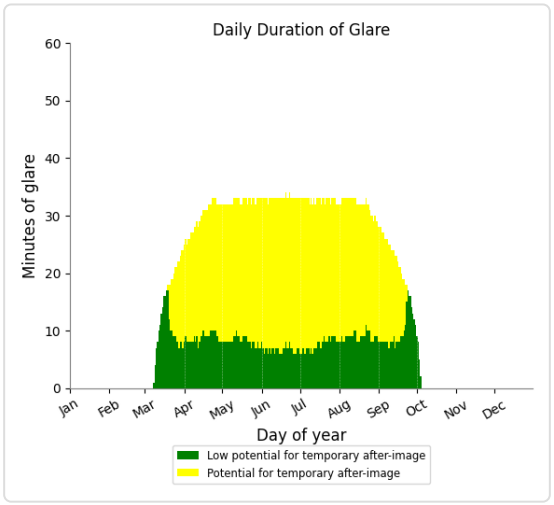


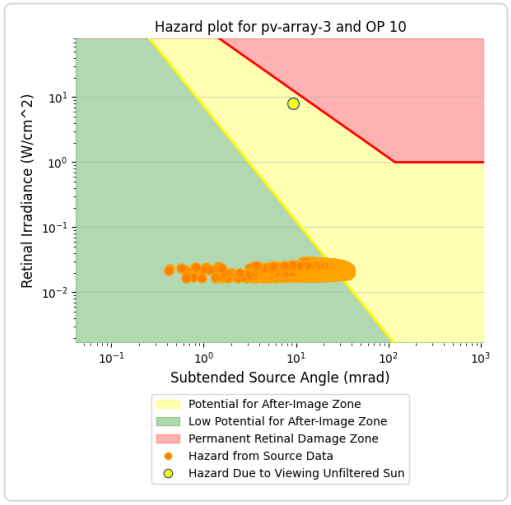
PV array 3 and OP 10

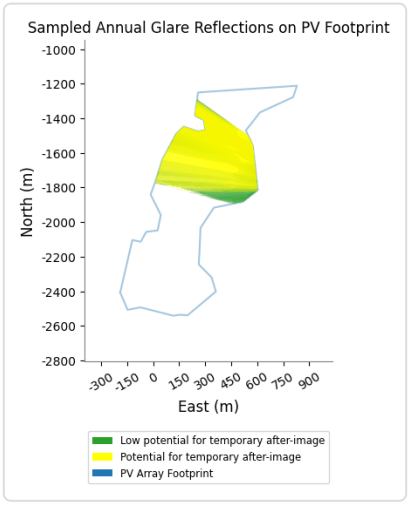
Yellow glare: 4,159 min.

Green glare: 1,787 min.





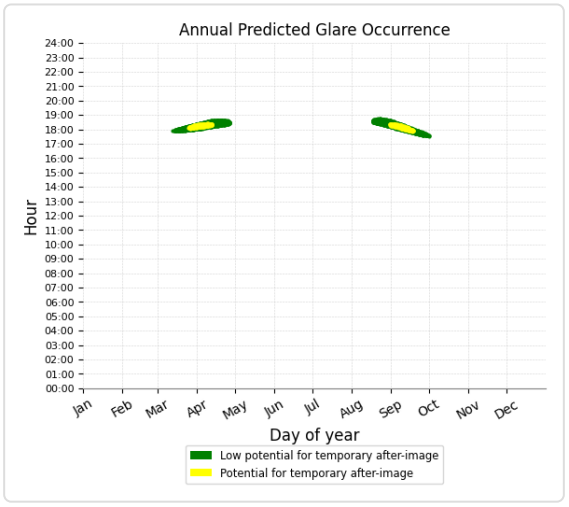


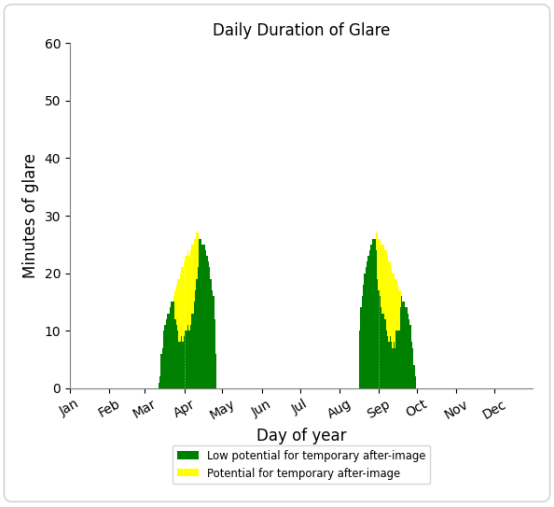


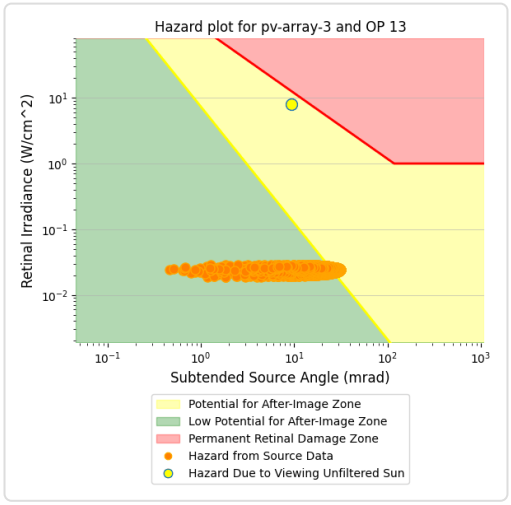
PV array 3 and OP 13

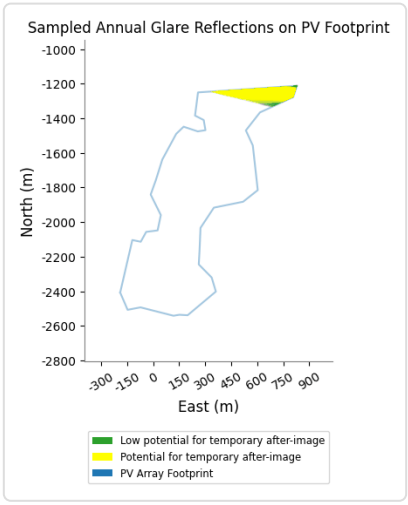
Yellow glare: 415 min.

Green glare: 1,286 min.





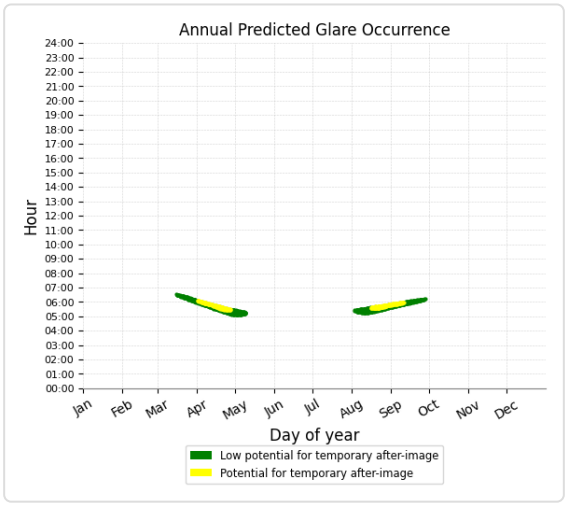


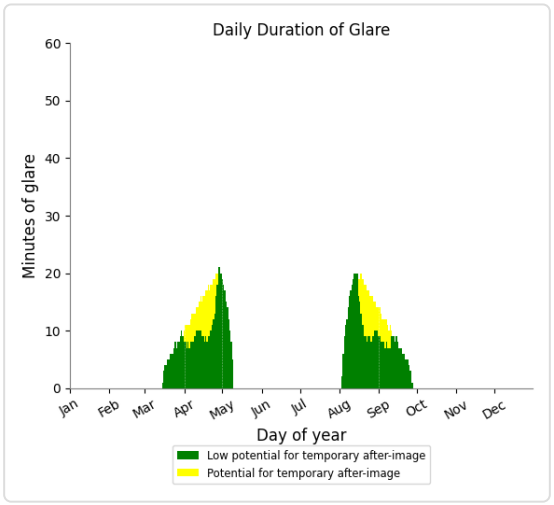


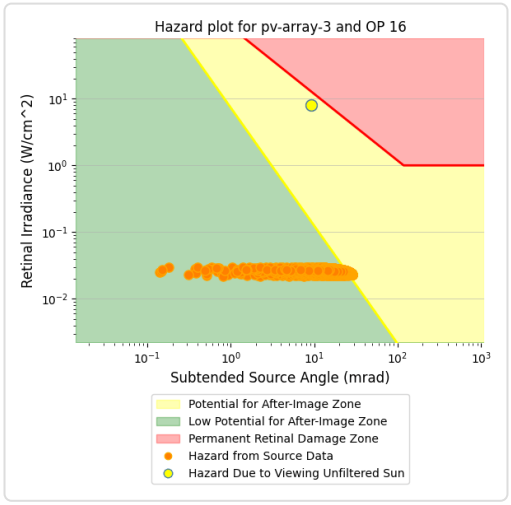
PV array 3 and OP 16

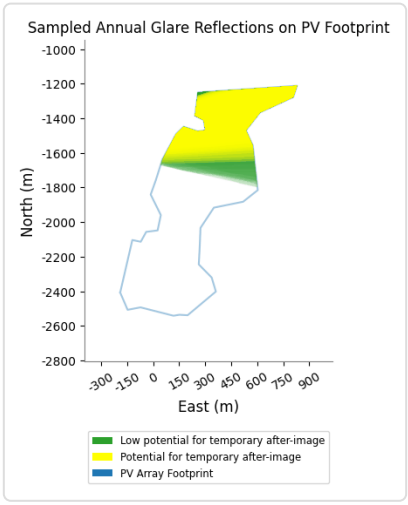
Yellow glare: 296 min.

Green glare: 1,084 min.





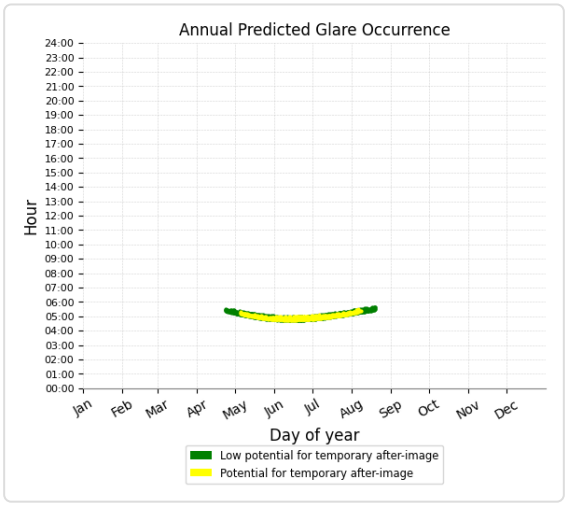


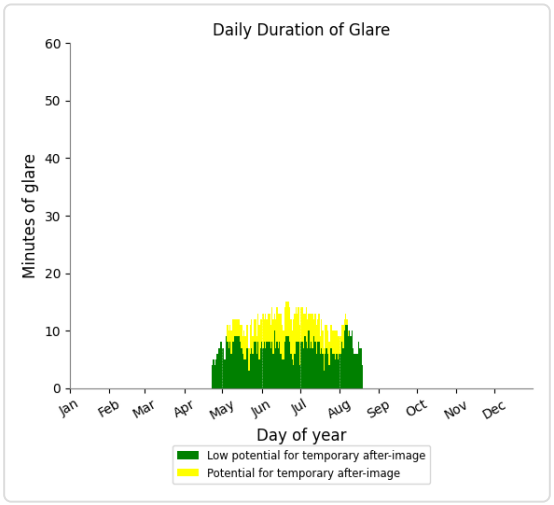


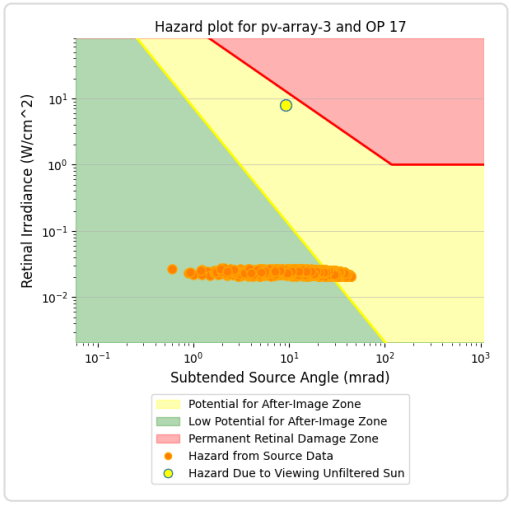
PV array 3 and OP 17

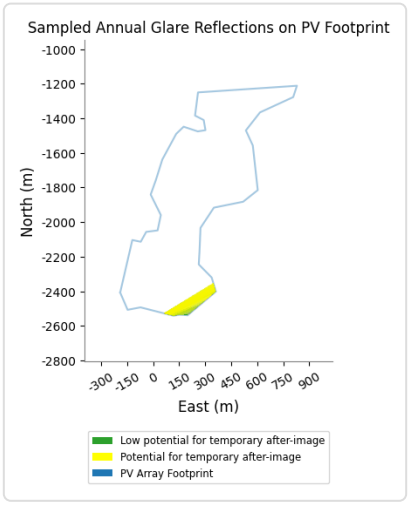
Yellow glare: 433 min.

Green glare: 840 min.





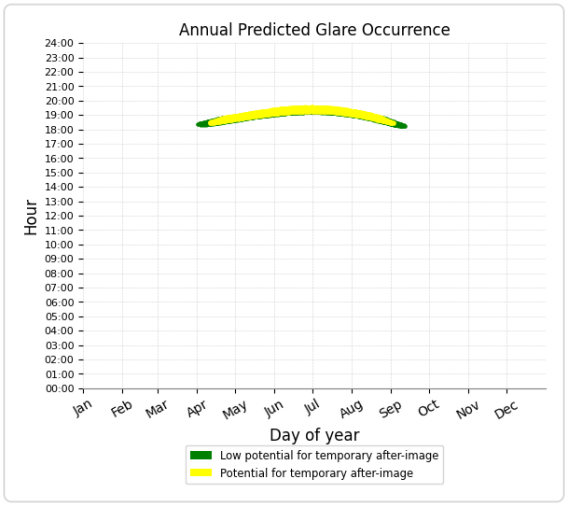


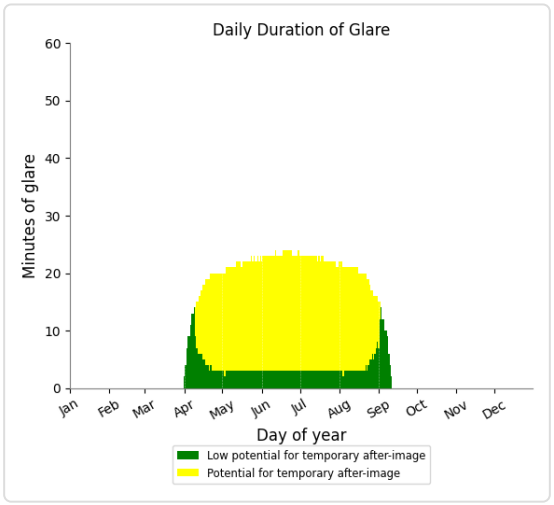


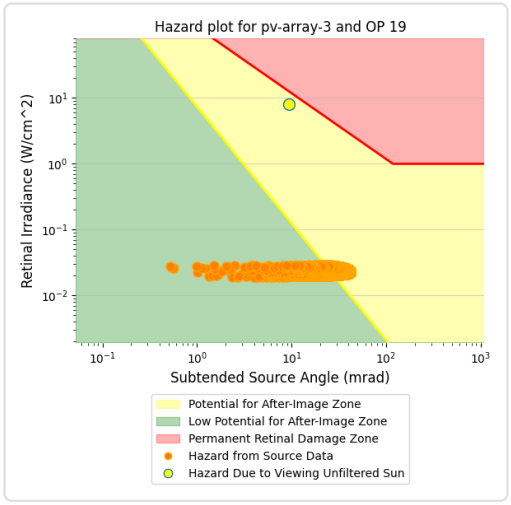
PV array 3 and OP 19

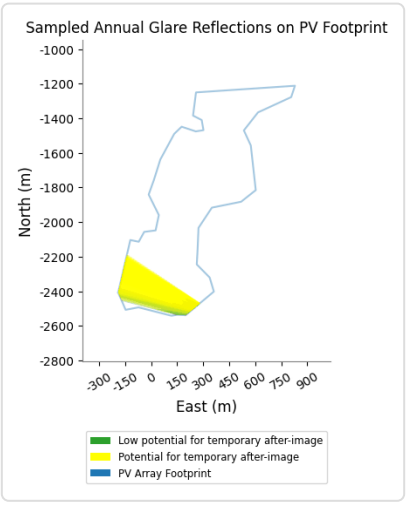
Yellow glare: 2,592 min.

Green glare: 663 min.





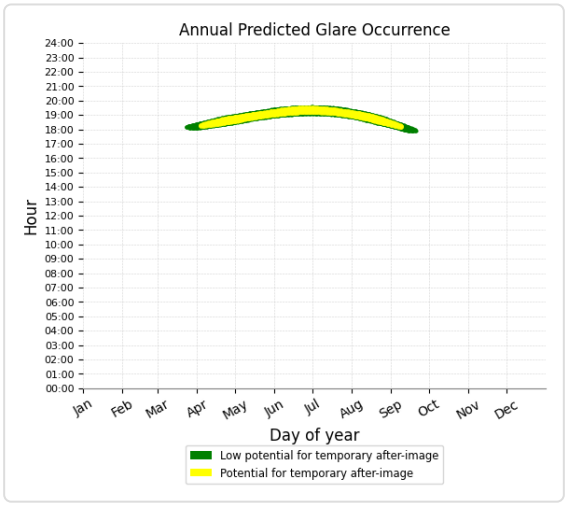


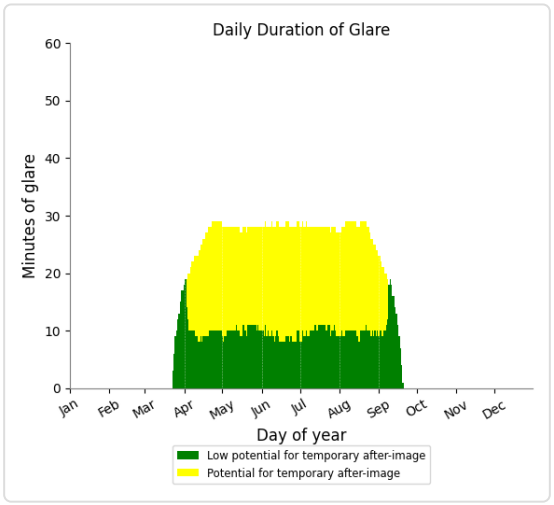


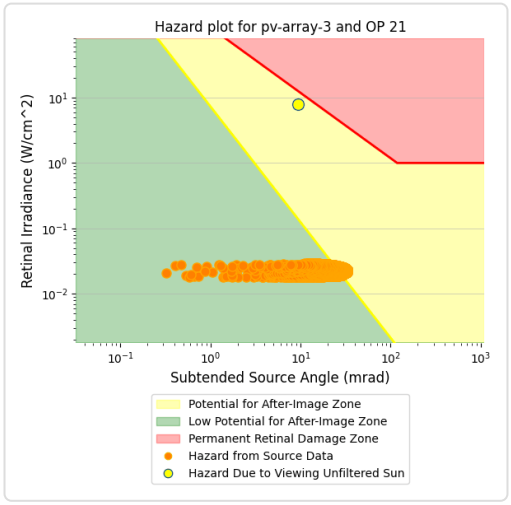
PV array 3 and OP 21

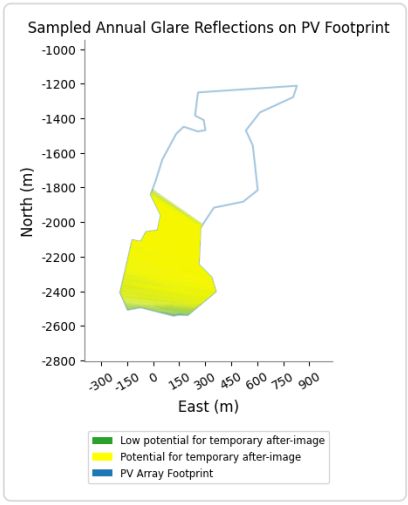
Yellow glare: 2,781 min.

Green glare: 1,827 min.





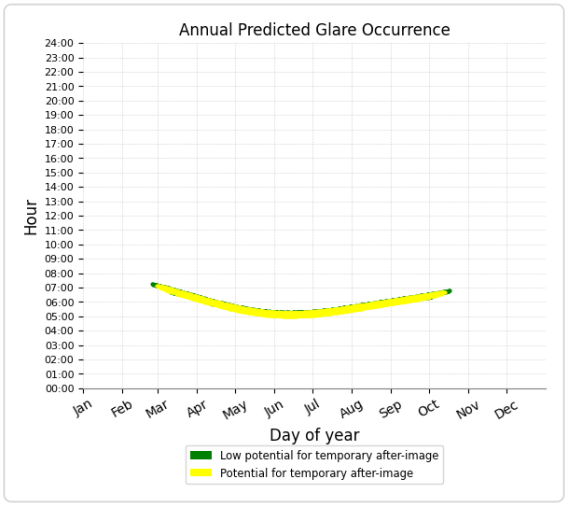


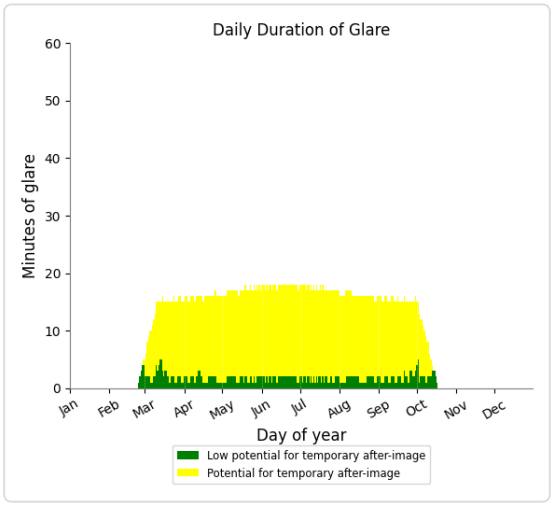


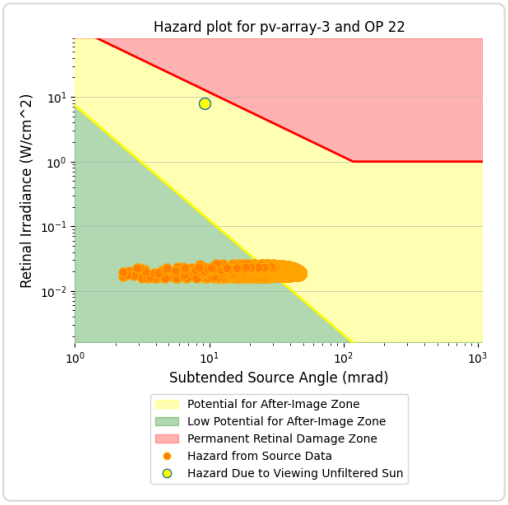
PV array 3 and OP 22

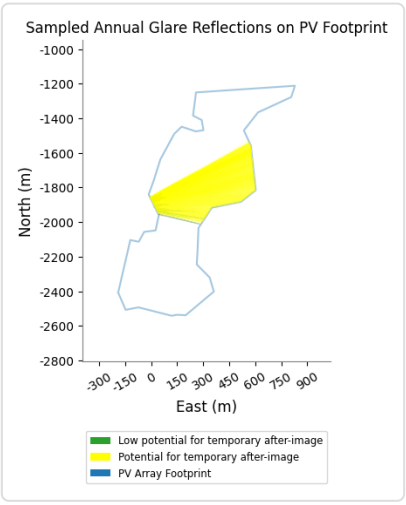
Yellow glare: 3,181 min.

Green glare: 426 min.





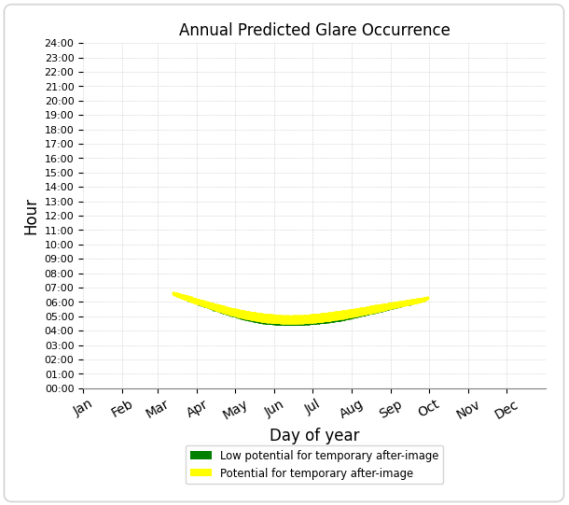


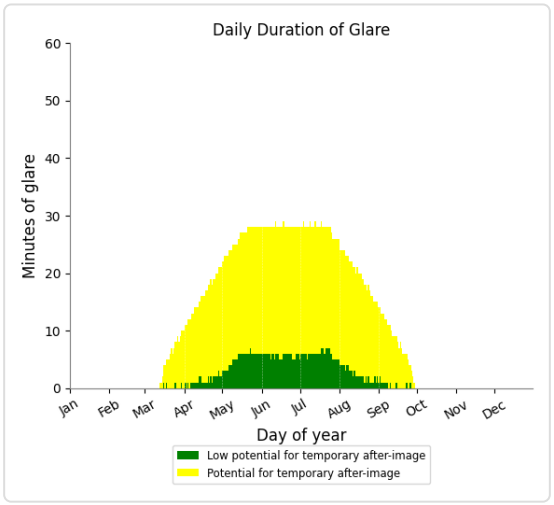


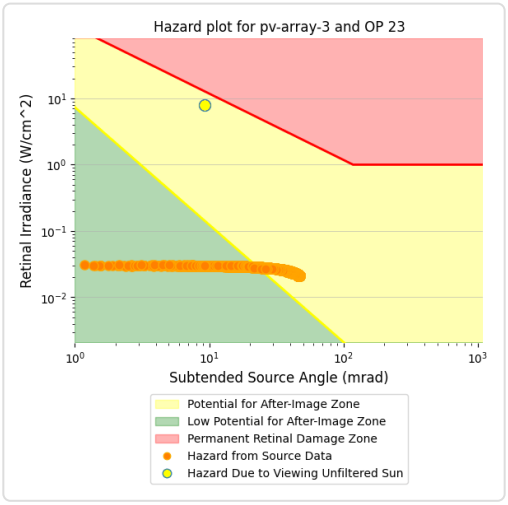
PV array 3 and OP 23

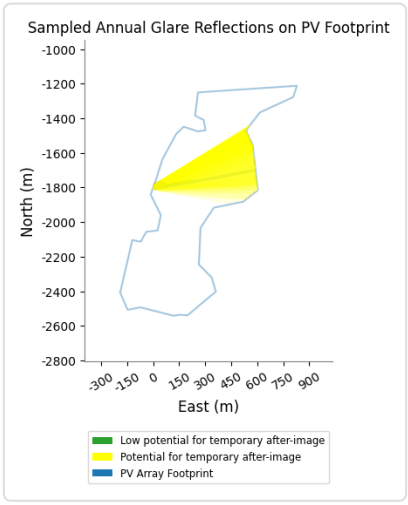
Yellow glare: 3,314 min.

Green glare: 648 min.





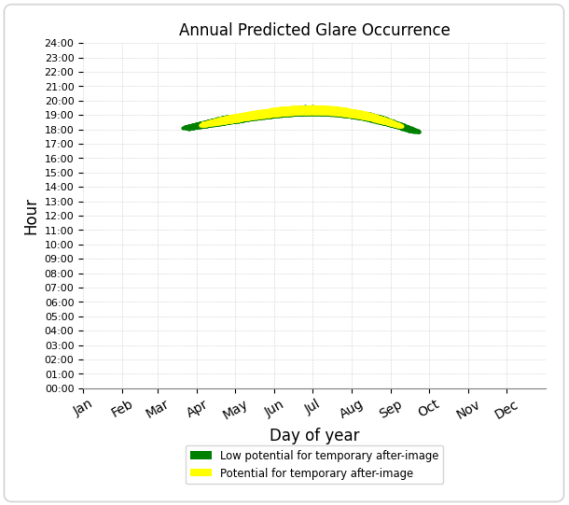


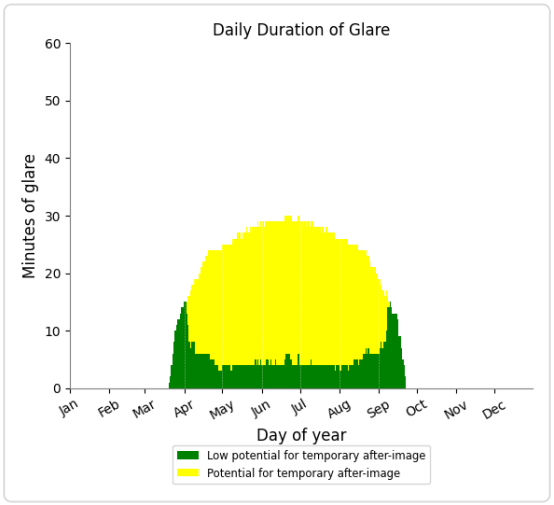


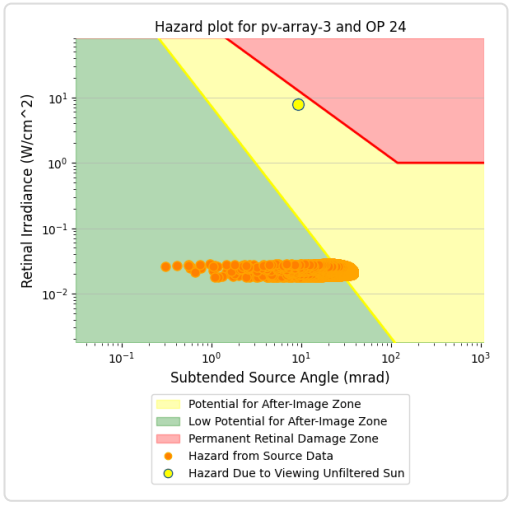
PV array 3 and OP 24

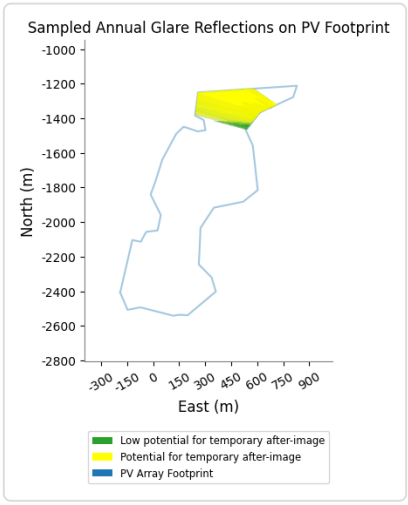
Yellow glare: 3,256 min.

Green glare: 1,059 min.





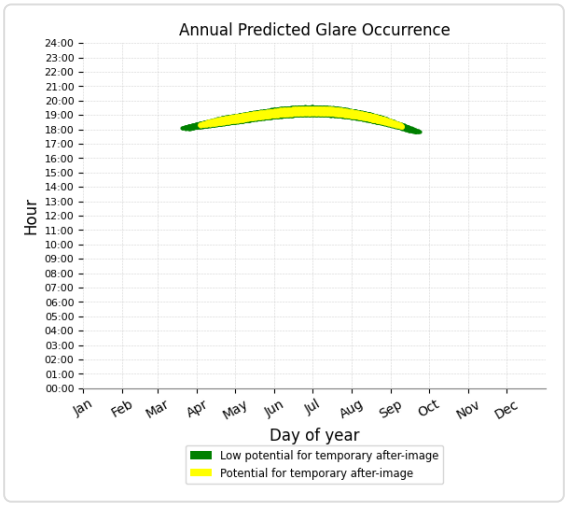


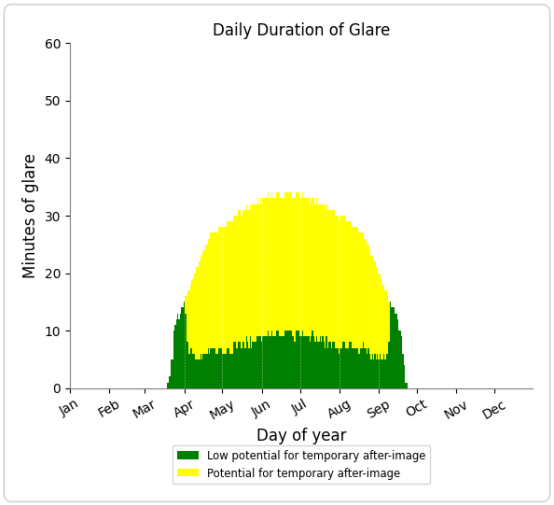


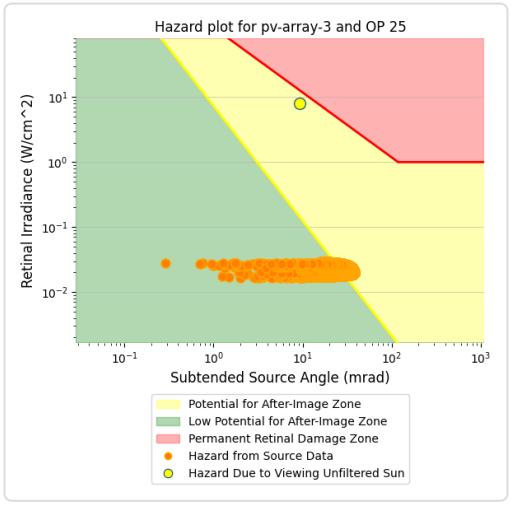
PV array 3 and OP 25

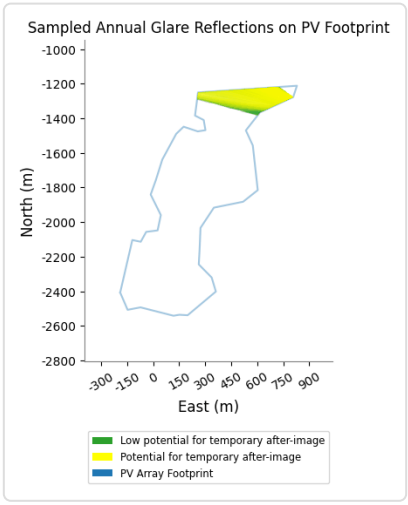
Yellow glare: 3,373 min.

Green glare: 1,487 min.





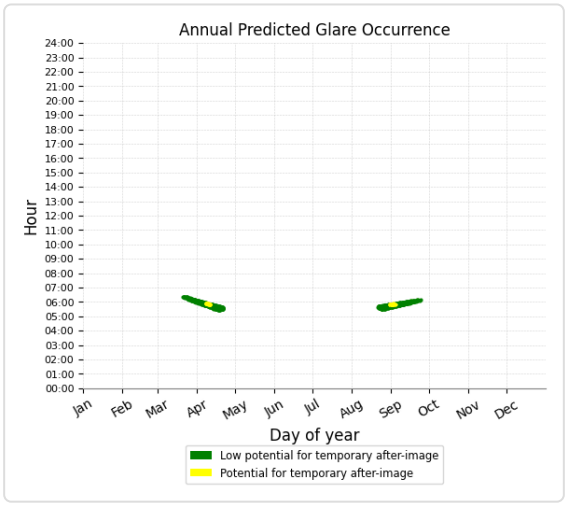


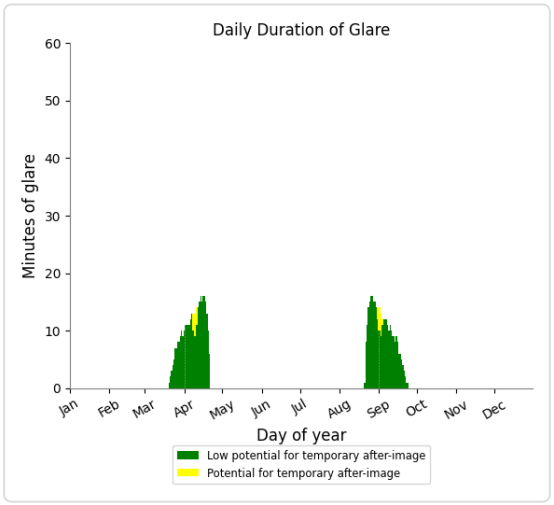


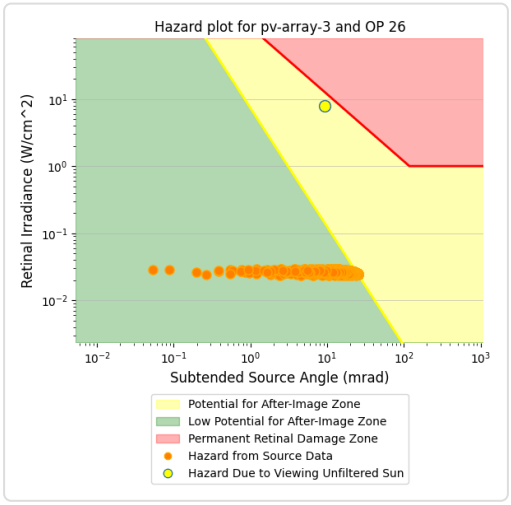
PV array 3 and OP 26

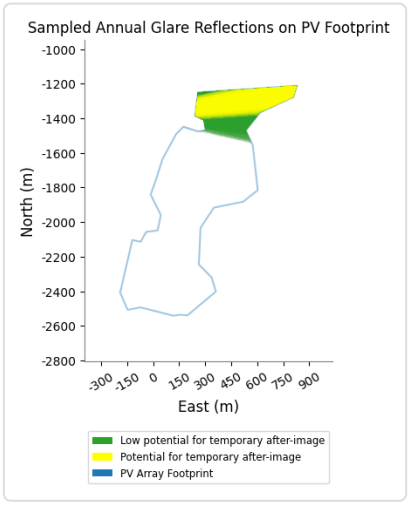
Yellow glare: 29 min.

Green glare: 653 min.





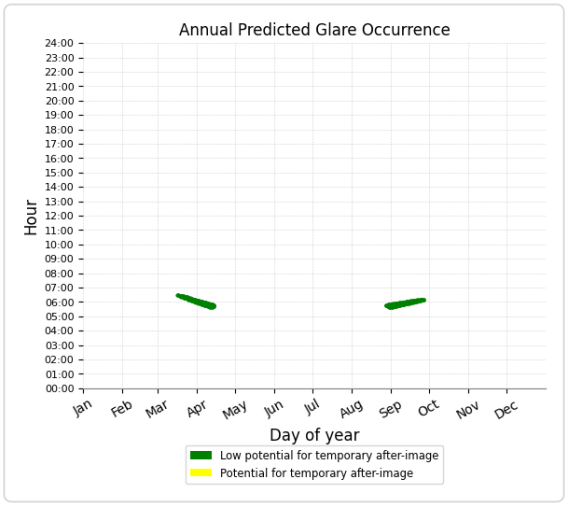


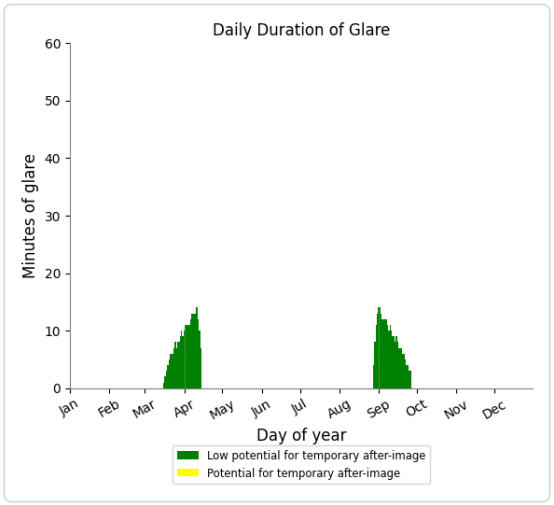


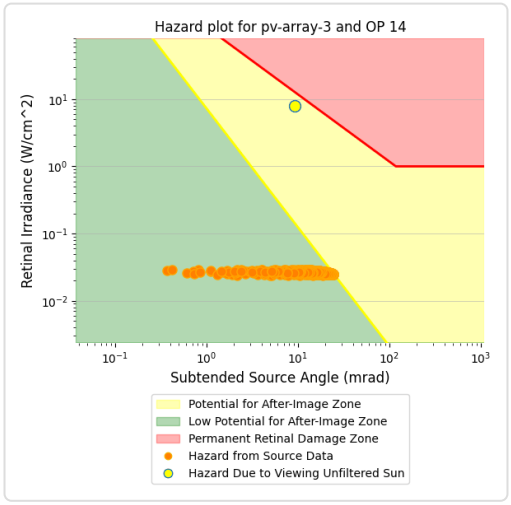
PV array 3 and OP 14

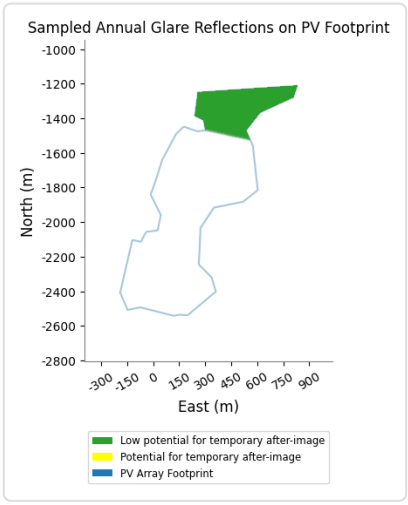
Yellow glare: none

Green glare: 522 min.





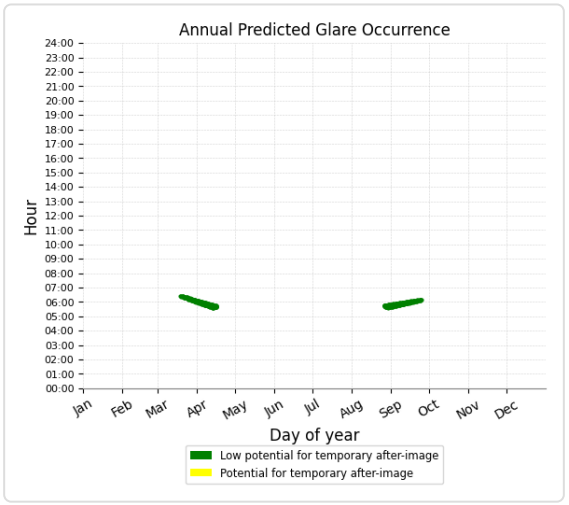


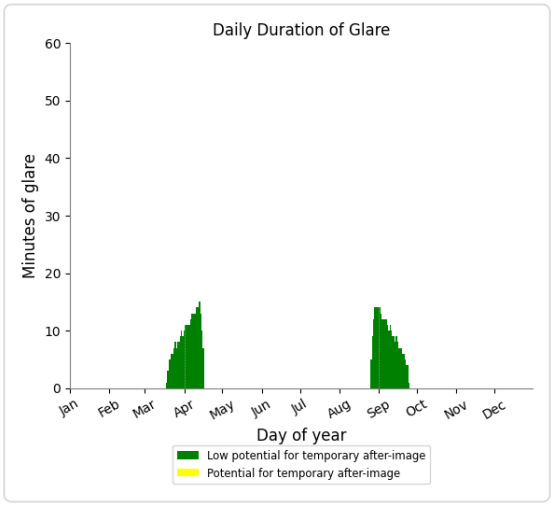


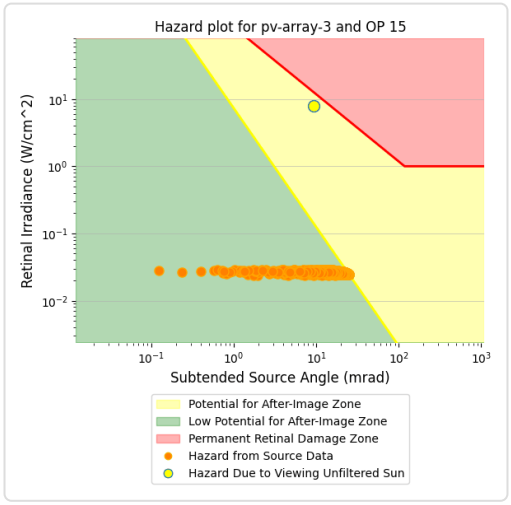
PV array 3 and OP 15

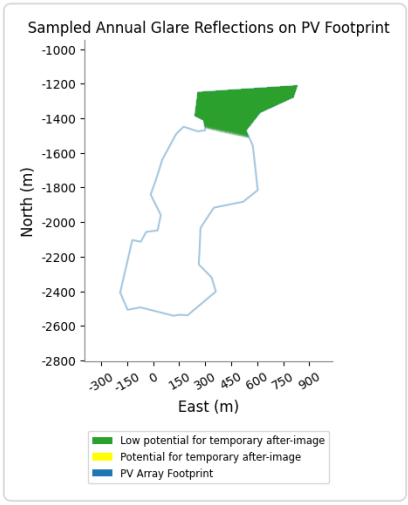
Yellow glare: none

Green glare: 572 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 11

No glare found

PV array 3 and OP 12

No glare found

PV array 3 and OP 18

No glare found

PV array 3 and OP 20

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 29

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

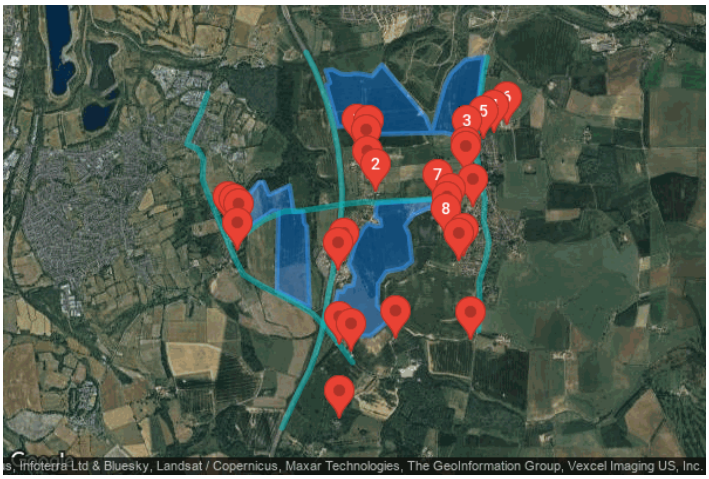
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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 3**
Site configuration: **JS W3 - RR and Transport-temp-8**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153754.25517

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	15,052	250.9	23,804	396.7	-
PV array 2	25.0	180.0	159,207	2,653.4	88,656	1,477.6	-
PV array 3	25.0	180.0	16,995	283.2	40,936	682.3	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

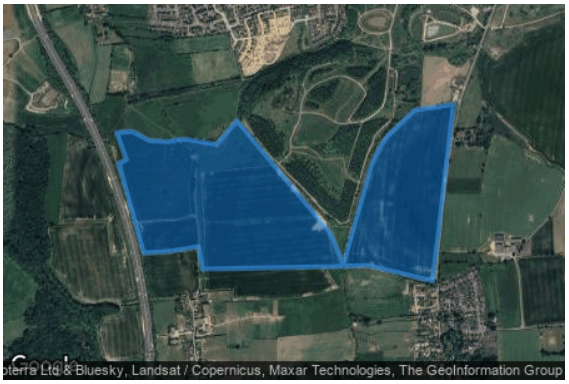
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	1,254	20.9	10,026	167.1
Route 4	2,586	43.1	3,536	58.9
Route 3	151,457	2,524.3	73,412	1,223.5
Route 2	269	4.5	993	16.6
OP 1	683	11.4	1,987	33.1
OP 2	580	9.7	0	0.0
OP 3	460	7.7	1,606	26.8
OP 4	1,006	16.8	3,910	65.2
OP 5	1,894	31.6	4,733	78.9
OP 6	751	12.5	3,128	52.1
OP 7	1,529	25.5	3,399	56.6
OP 8	1,678	28.0	3,116	51.9
OP 9	2,618	43.6	3,820	63.7
OP 10	2,496	41.6	4,341	72.3

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 11	531	8.8	625	10.4
OP 12	783	13.1	167	2.8
OP 13	1,636	27.3	661	11.0
OP 14	1,615	26.9	1,948	32.5
OP 15	2,230	37.2	3,163	52.7
OP 16	1,585	26.4	3,004	50.1
OP 17	537	8.9	339	5.7
OP 18	0	0.0	0	0.0
OP 19	1,181	19.7	2,975	49.6
OP 20	0	0.0	0	0.0
OP 21	1,993	33.2	3,337	55.6
OP 22	698	11.6	4,158	69.3
OP 23	1,322	22.0	4,083	68.0
OP 24	1,464	24.4	2,912	48.5
OP 25	1,578	26.3	3,108	51.8
OP 26	2,733	45.5	2,512	41.9
OP 27	646	10.8	955	15.9
OP 28	542	9.0	1,442	24.0
OP 29	919	15.3	0	0.0

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332141	-1.279756	90.99	3.80	94.79
2	53.332179	-1.281114	93.71	3.80	97.51
3	53.332559	-1.282304	96.34	3.80	100.14
4	53.332507	-1.283377	99.28	3.80	103.08
5	53.331405	-1.282712	97.51	3.80	101.31
6	53.331252	-1.283248	100.06	3.80	103.86
7	53.327587	-1.281531	105.78	3.80	109.58
8	53.327651	-1.279665	115.20	3.80	119.00
9	53.327843	-1.277755	105.29	3.80	109.09
10	53.326920	-1.277497	106.91	3.80	110.71
11	53.327036	-1.267863	90.02	3.80	93.82
12	53.327074	-1.266125	91.84	3.80	95.64
13	53.326433	-1.261662	99.50	3.80	103.30
14	53.333661	-1.260224	89.56	3.80	93.36
15	53.333430	-1.262885	88.21	3.80	92.01
16	53.332367	-1.264794	90.44	3.80	94.24
17	53.331828	-1.265352	89.00	3.80	92.80
18	53.331226	-1.265846	88.66	3.80	92.46
19	53.327122	-1.267807	90.13	3.80	93.93
20	53.328381	-1.268657	89.34	3.80	93.14
21	53.332994	-1.275116	89.05	3.80	92.85
22	53.332021	-1.276532	88.05	3.80	91.85
23	53.332226	-1.278399	90.83	3.80	94.63
24	53.332213	-1.279300	91.06	3.80	94.86

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.322460	-1.288645	97.50	3.80	101.30
2	53.321639	-1.291649	102.80	3.80	106.60
3	53.322780	-1.292454	93.40	3.80	97.20
4	53.322745	-1.293141	93.60	3.80	97.40
5	53.321896	-1.294396	96.50	3.80	100.30
6	53.320230	-1.295383	104.90	3.80	108.70
7	53.318691	-1.294911	109.70	3.80	113.50
8	53.320230	-1.291134	114.20	3.80	118.00
9	53.320204	-1.290276	114.80	3.80	118.60
10	53.313282	-1.290534	137.70	3.80	141.50
11	53.311795	-1.285684	130.10	3.80	133.90
12	53.318871	-1.286113	103.90	3.80	107.70
13	53.319230	-1.286521	102.90	3.80	106.70
14	53.320191	-1.286628	99.20	3.80	103.00
15	53.320165	-1.288044	105.20	3.80	109.00

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.310510	-1.282613	128.50	3.80	132.30
2	53.309613	-1.281969	123.20	3.80	127.00
3	53.309741	-1.280853	123.40	3.80	127.20
4	53.309305	-1.277999	116.70	3.80	120.50
5	53.309357	-1.277484	116.30	3.80	120.10
6	53.309331	-1.276776	113.30	3.80	117.10
7	53.310562	-1.274330	105.20	3.80	109.00
8	53.311292	-1.274695	105.50	3.80	109.30
9	53.311972	-1.275810	107.30	3.80	111.10
10	53.312651	-1.275746	105.90	3.80	109.70
11	53.313869	-1.275660	104.40	3.80	108.20
12	53.314920	-1.274502	103.80	3.80	107.60
13	53.315228	-1.271970	105.20	3.80	109.00
14	53.315831	-1.270704	104.50	3.80	108.30
15	53.318151	-1.271133	104.70	3.80	108.50
16	53.318933	-1.271733	104.80	3.80	108.60
17	53.319868	-1.270510	101.50	3.80	105.30
18	53.320663	-1.267635	95.70	3.80	99.50
19	53.321253	-1.267313	95.10	3.80	98.90
20	53.320907	-1.275875	110.60	3.80	114.40
21	53.319702	-1.276132	113.30	3.80	117.10
22	53.319471	-1.275381	114.10	3.80	117.90
23	53.318945	-1.275231	116.50	3.80	120.30
24	53.318881	-1.275896	119.00	3.80	122.80
25	53.319125	-1.277119	114.60	3.80	118.40
26	53.318753	-1.277763	113.90	3.80	117.70
27	53.317420	-1.278965	117.70	3.80	121.50
28	53.316356	-1.279523	117.50	3.80	121.30
29	53.315600	-1.279973	121.80	3.80	125.60
30	53.314536	-1.279093	119.30	3.80	123.10
31	53.313738	-1.279373	121.00	3.80	124.80
32	53.313662	-1.280360	125.70	3.80	129.50
33	53.313149	-1.280833	128.20	3.80	132.00
34	53.313238	-1.281562	128.30	3.80	132.10

Route Receptors

Name: Route 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



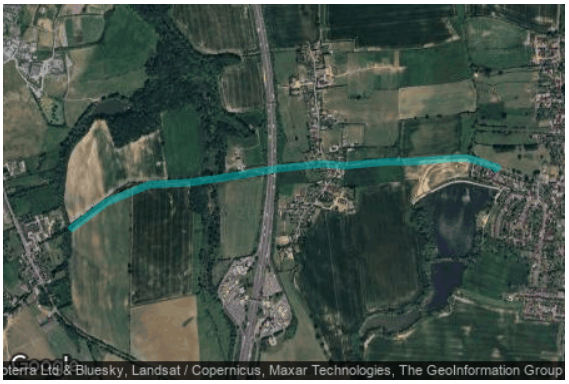
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.330501	-1.300663	59.90	1.50	61.40
2	53.328810	-1.301650	67.30	1.50	68.80
3	53.327221	-1.302894	72.70	1.50	74.20
4	53.326067	-1.303667	77.30	1.50	78.80
5	53.325657	-1.302143	85.50	1.50	87.00
6	53.324786	-1.301264	99.10	1.50	100.60
7	53.322940	-1.301392	105.10	1.50	106.60
8	53.321223	-1.300277	112.20	1.50	113.70
9	53.319480	-1.299075	118.00	1.50	119.50
10	53.317839	-1.297916	122.50	1.50	124.00
11	53.316198	-1.296758	126.00	1.50	127.50
12	53.314685	-1.295427	128.60	1.50	130.10
13	53.313711	-1.292809	133.40	1.50	134.90
14	53.312942	-1.290234	136.70	1.50	138.20
15	53.312173	-1.287660	137.10	1.50	138.60
16	53.311250	-1.285213	131.10	1.50	132.60
17	53.309916	-1.283068	125.80	1.50	127.30
18	53.308506	-1.281265	126.20	1.50	127.70
19	53.307019	-1.279420	129.20	1.50	130.70

Name: Route 4
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.333628	-1.259688	91.40	1.50	92.90
2	53.332039	-1.260289	102.00	1.50	103.50
3	53.330322	-1.260632	105.90	1.50	107.40
4	53.328502	-1.261061	102.80	1.50	104.30
5	53.326656	-1.261233	100.00	1.50	101.50
6	53.324734	-1.261147	105.20	1.50	106.70
7	53.323017	-1.260632	116.30	1.50	117.80
8	53.321197	-1.260031	113.20	1.50	114.70
9	53.319377	-1.260203	110.90	1.50	112.40
10	53.317531	-1.259430	120.10	1.50	121.60
11	53.315762	-1.259988	129.20	1.50	130.70
12	53.314018	-1.260846	139.60	1.50	141.10
13	53.311711	-1.260761	146.60	1.50	148.10
14	53.309788	-1.260975	136.60	1.50	138.10

Name: Route 3
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.318402	-1.294781	112.30	1.50	113.80
2	53.319466	-1.292378	117.80	1.50	119.30
3	53.320171	-1.289481	111.30	1.50	112.80
4	53.320274	-1.286541	99.10	1.50	100.60
5	53.320556	-1.283408	107.40	1.50	108.90
6	53.320851	-1.280447	106.50	1.50	108.00
7	53.321030	-1.277529	107.80	1.50	109.30
8	53.320953	-1.275984	111.00	1.50	112.50
9	53.321043	-1.274503	109.40	1.50	110.90
10	53.321120	-1.272991	107.20	1.50	108.70
11	53.321120	-1.271478	104.30	1.50	105.80
12	53.321261	-1.268452	95.80	1.50	97.30
13	53.321270	-1.267701	95.30	1.50	96.80
14	53.321171	-1.267004	95.40	1.50	96.90
15	53.320876	-1.265555	97.80	1.50	99.30
16	53.320830	-1.265730	98.60	1.50	100.10

Name: Route 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.334058	-1.286221	101.46	0.00	101.46
2	53.332571	-1.284933	102.48	0.00	102.48
3	53.330764	-1.283796	103.72	0.00	103.72
4	53.329137	-1.282916	105.49	0.00	105.49
5	53.327330	-1.282122	108.36	0.00	108.36
6	53.325562	-1.281543	108.46	0.00	108.46
7	53.323728	-1.281202	109.46	0.00	109.46
8	53.321985	-1.280945	110.49	0.00	110.49
9	53.320229	-1.281052	111.89	0.00	111.89
10	53.318392	-1.281333	118.41	0.00	118.41
11	53.316597	-1.281806	122.52	0.00	122.52
12	53.314828	-1.282299	126.72	0.00	126.72
13	53.313072	-1.282921	130.58	0.00	130.58
14	53.311349	-1.283406	132.63	0.00	132.63
15	53.309541	-1.283963	132.65	0.00	132.65
16	53.307785	-1.284800	131.77	0.00	131.77
17	53.306157	-1.285830	129.30	0.00	129.30
18	53.304567	-1.287225	127.34	0.00	127.34
19	53.301307	-1.289756	123.87	0.00	123.87

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.325780	-1.278642	113.30	2.00
OP 2	2	53.321845	-1.276003	112.00	2.00
OP 3	3	53.325621	-1.262612	101.60	2.00
OP 4	4	53.326941	-1.258567	102.50	2.00
OP 5	5	53.326448	-1.260252	101.00	2.00
OP 6	6	53.327736	-1.256754	100.90	2.00
OP 7	7	53.320963	-1.266795	97.80	2.00
OP 8	8	53.317996	-1.265680	108.90	2.00
OP 9	9	53.316201	-1.263115	119.90	2.00
OP 10	10	53.315830	-1.263845	120.90	2.00
OP 11	11	53.323805	-1.262659	106.90	2.00
OP 12	12	53.323344	-1.262734	107.70	2.00
OP 13	13	53.320511	-1.261699	108.30	2.00
OP 14	14	53.318949	-1.297626	117.80	2.00
OP 15	15	53.318789	-1.296725	113.10	2.00
OP 16	16	53.316764	-1.296199	119.80	2.00
OP 17	17	53.308488	-1.281366	126.70	2.00
OP 18	18	53.307886	-1.279509	128.70	2.00
OP 19	19	53.309030	-1.273113	114.50	2.00
OP 20	20	53.302066	-1.281255	135.50	2.00
OP 21	21	53.308953	-1.261997	131.00	2.00
OP 22	22	53.314933	-1.281447	129.50	2.00
OP 23	23	53.315760	-1.280643	123.00	2.00
OP 24	24	53.318939	-1.265461	106.50	2.00
OP 25	25	53.319702	-1.264925	104.70	2.00
OP 26	26	53.318372	-1.296070	110.40	2.00
OP 27	27	53.324801	-1.277393	108.40	2.00
OP 28	28	53.325640	-1.276921	106.40	2.00
OP 29	29	53.322962	-1.277082	112.80	2.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	25.0	180.0	15,052	250.9	23,804	396.7	-
PV array 2	25.0	180.0	159,207	2,653.4	88,656	1,477.6	-
PV array 3	25.0	180.0	16,995	283.2	40,936	682.3	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	1,254	20.9	10,026	167.1
Route 4	2,586	43.1	3,536	58.9
Route 3	151,457	2,524.3	73,412	1,223.5
Route 2	269	4.5	993	16.6
OP 1	683	11.4	1,987	33.1
OP 2	580	9.7	0	0.0
OP 3	460	7.7	1,606	26.8
OP 4	1,006	16.8	3,910	65.2
OP 5	1,894	31.6	4,733	78.9
OP 6	751	12.5	3,128	52.1
OP 7	1,529	25.5	3,399	56.6
OP 8	1,678	28.0	3,116	51.9
OP 9	2,618	43.6	3,820	63.7
OP 10	2,496	41.6	4,341	72.3
OP 11	531	8.8	625	10.4
OP 12	783	13.1	167	2.8
OP 13	1,636	27.3	661	11.0
OP 14	1,615	26.9	1,948	32.5
OP 15	2,230	37.2	3,163	52.7
OP 16	1,585	26.4	3,004	50.1
OP 17	537	8.9	339	5.7
OP 18	0	0.0	0	0.0
OP 19	1,181	19.7	2,975	49.6
OP 20	0	0.0	0	0.0
OP 21	1,993	33.2	3,337	55.6
OP 22	698	11.6	4,158	69.3
OP 23	1,322	22.0	4,083	68.0
OP 24	1,464	24.4	2,912	48.5
OP 25	1,578	26.3	3,108	51.8
OP 26	2,733	45.5	2,512	41.9

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 27	646	10.8	955	15.9
OP 28	542	9.0	1,442	24.0
OP 29	919	15.3	0	0.0

PV: PV array 1 potential temporary after-image

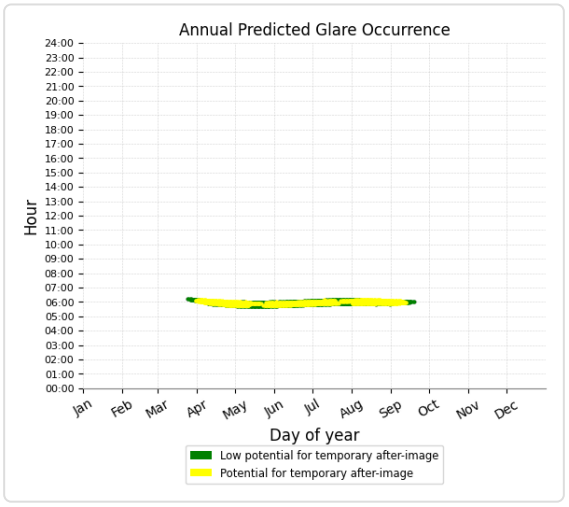
Receptor results ordered by category of glare

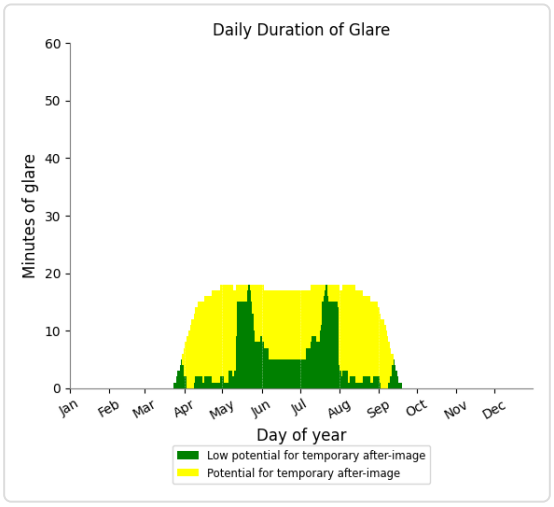
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	932	15.5	1,794	29.9
Route 4	2,572	42.9	3,439	57.3
Route 3	934	15.6	0	0.0
Route 2	0	0.0	0	0.0
OP 1	683	11.4	1,987	33.1
OP 3	460	7.7	1,606	26.8
OP 4	1,006	16.8	3,910	65.2
OP 5	1,894	31.6	4,733	78.9
OP 6	751	12.5	3,128	52.1
OP 11	531	8.8	625	10.4
OP 12	783	13.1	167	2.8
OP 14	661	11.0	18	0.3
OP 27	646	10.8	955	15.9
OP 28	542	9.0	1,442	24.0
OP 15	835	13.9	0	0.0
OP 16	164	2.7	0	0.0
OP 26	760	12.7	0	0.0
OP 29	898	15.0	0	0.0
OP 2	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0

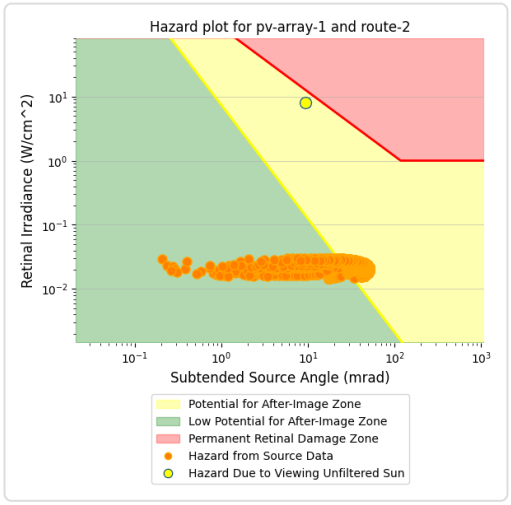
PV array 1 and Route: Route 1

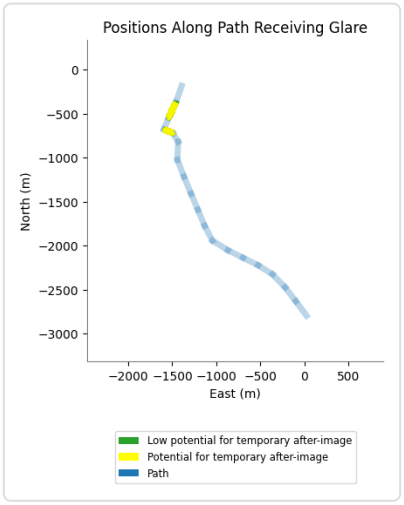
Yellow glare: 1,794 min.

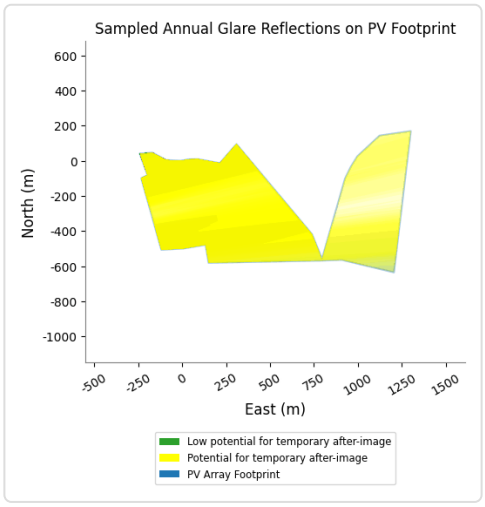
Green glare: 932 min.







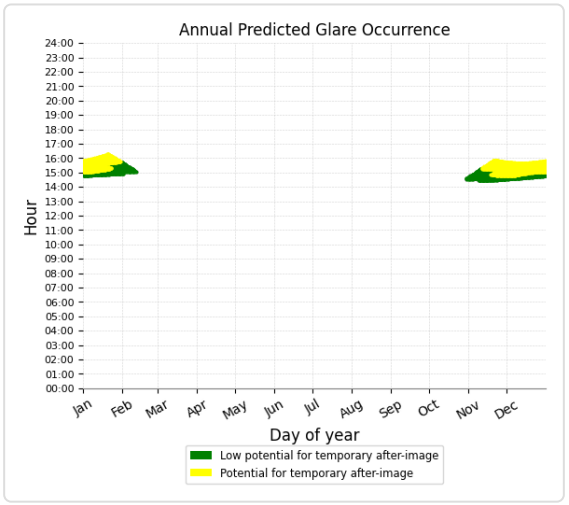


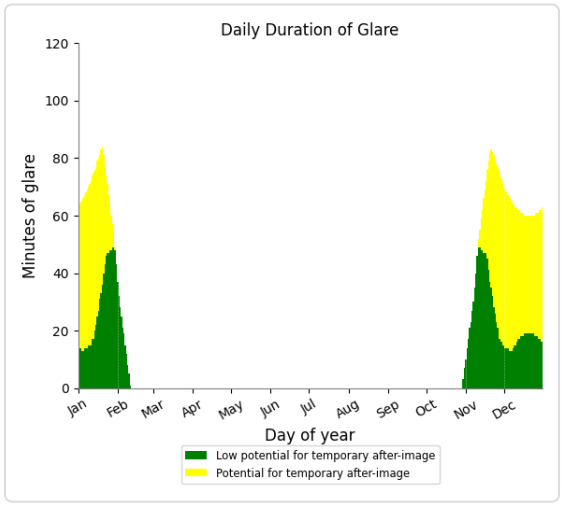


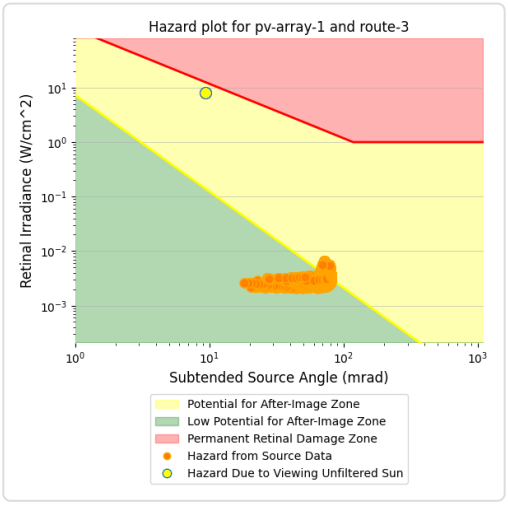
PV array 1 and Route: Route 4

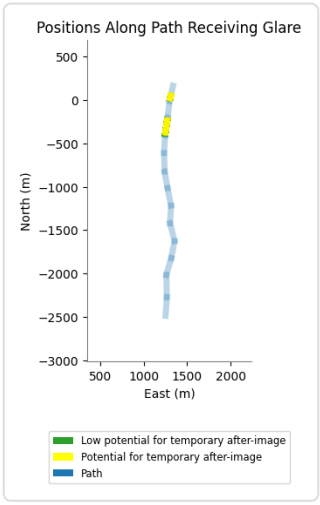
Yellow glare: 3,439 min.

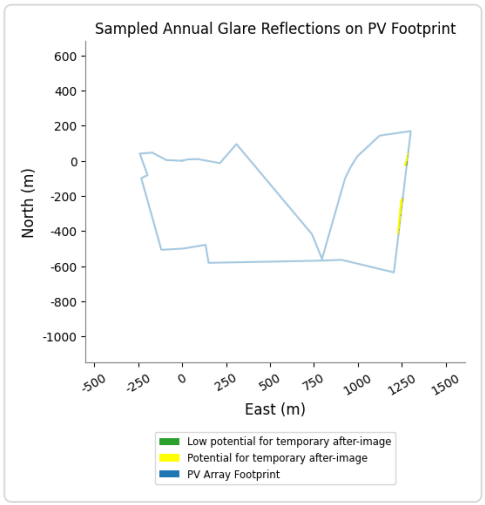
Green glare: 2,572 min.







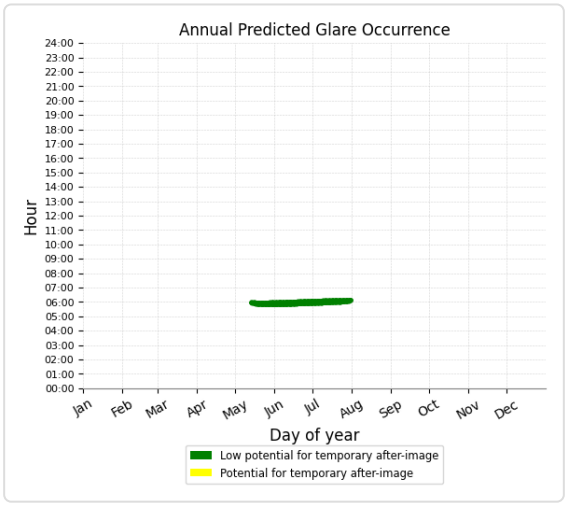


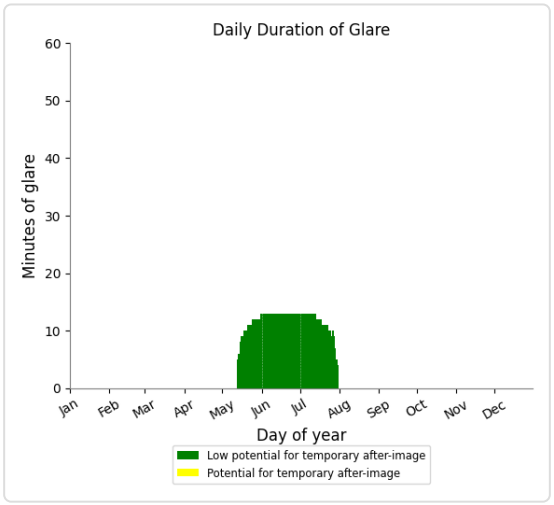


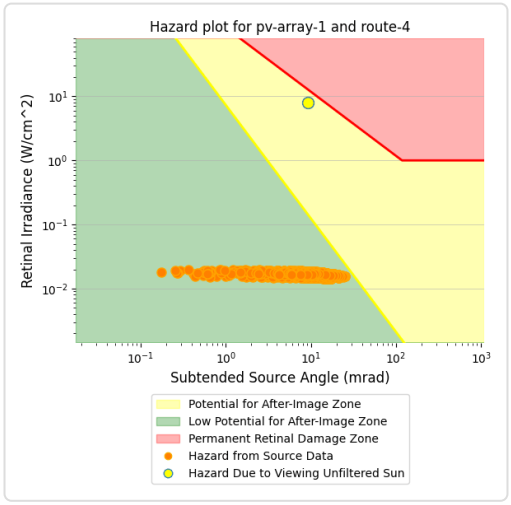
PV array 1 and Route: Route 3

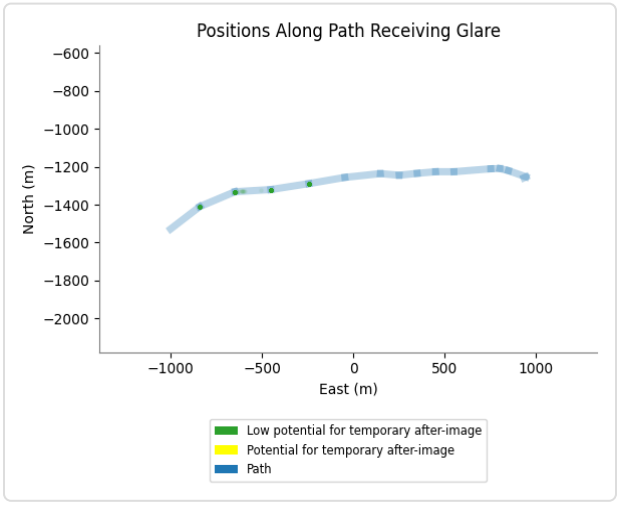
Yellow glare: none

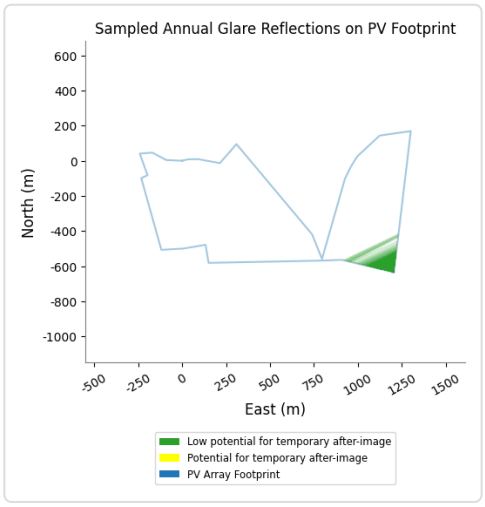
Green glare: 934 min.











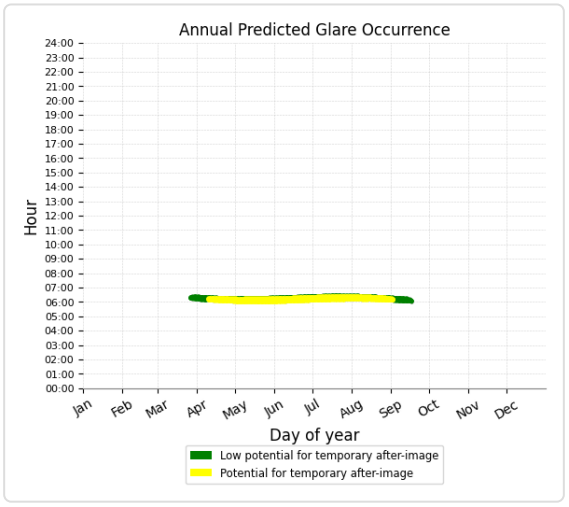
PV array 1 and Route: Route 2

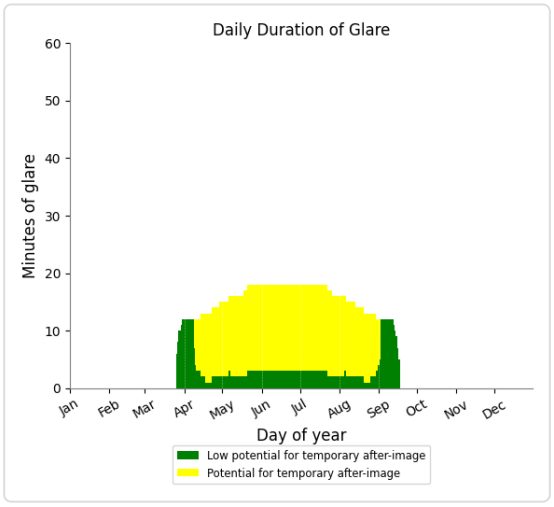
No glare found

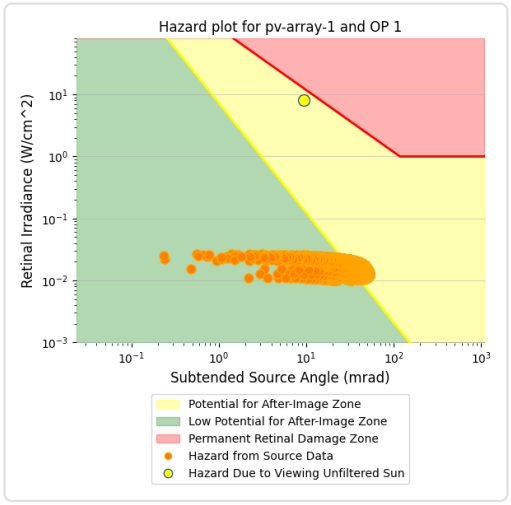
PV array 1 and OP 1

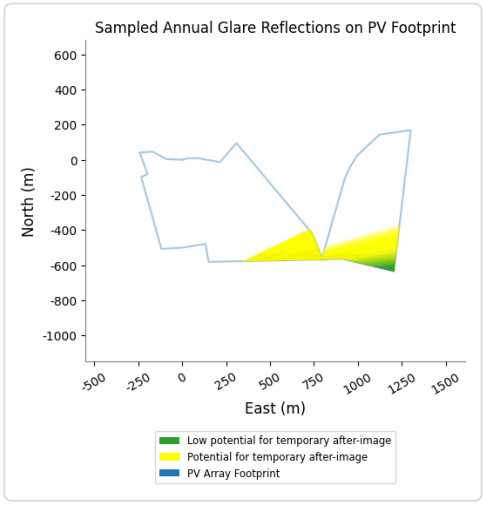
Yellow glare: 1,987 min.

Green glare: 683 min.





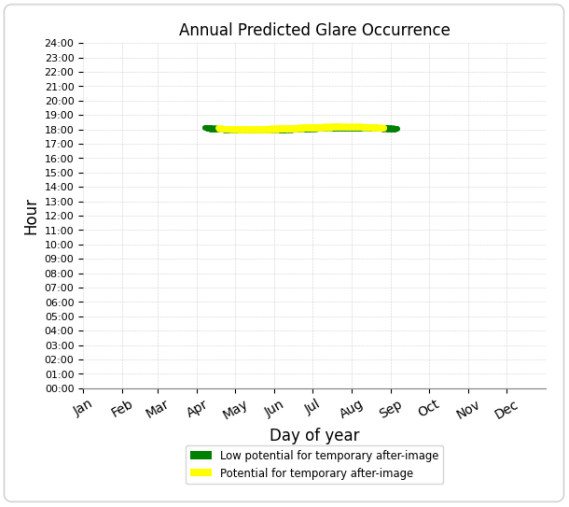


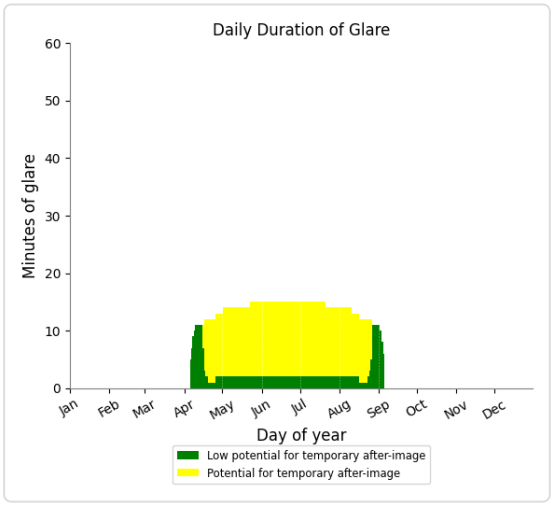


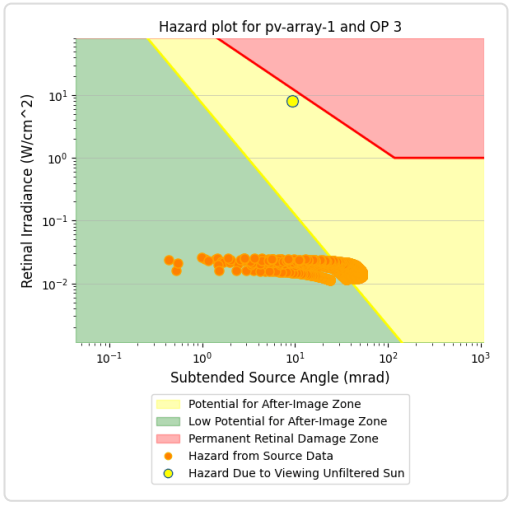
PV array 1 and OP 3

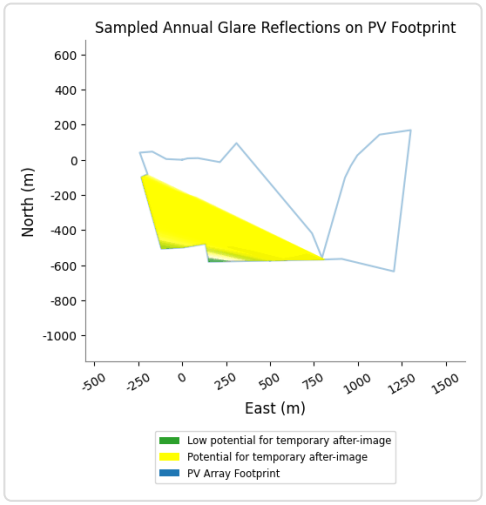
Yellow glare: 1,606 min.

Green glare: 460 min.





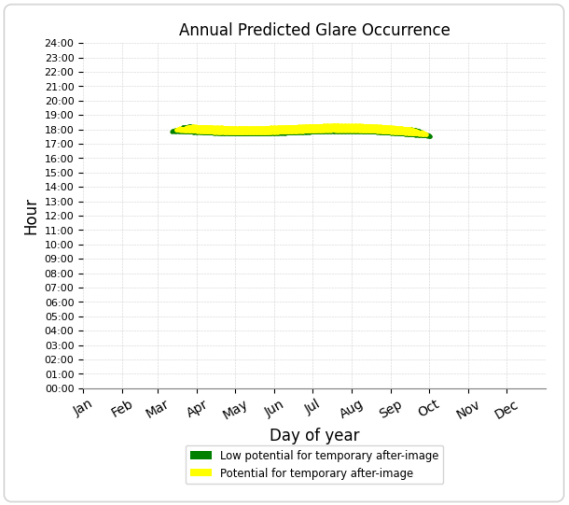


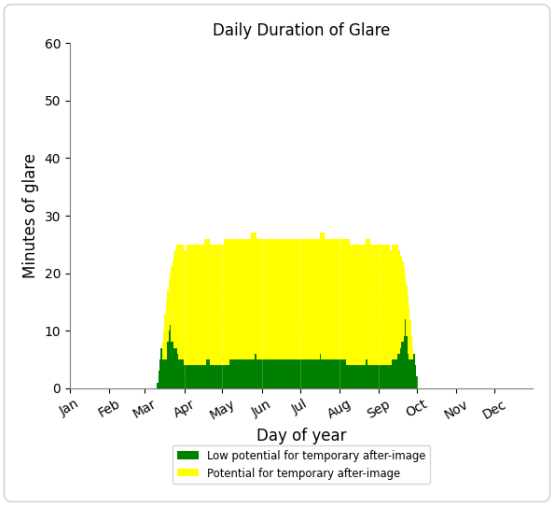


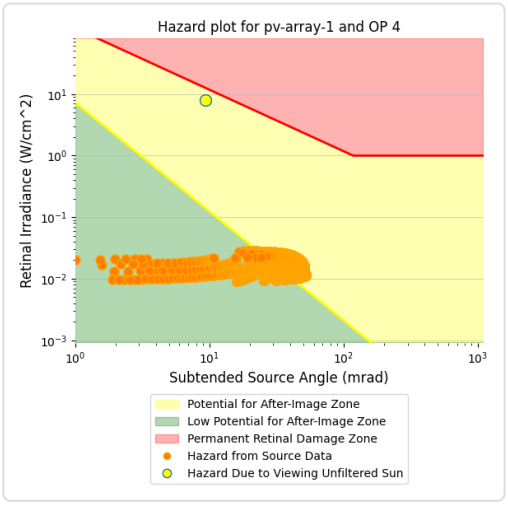
PV array 1 and OP 4

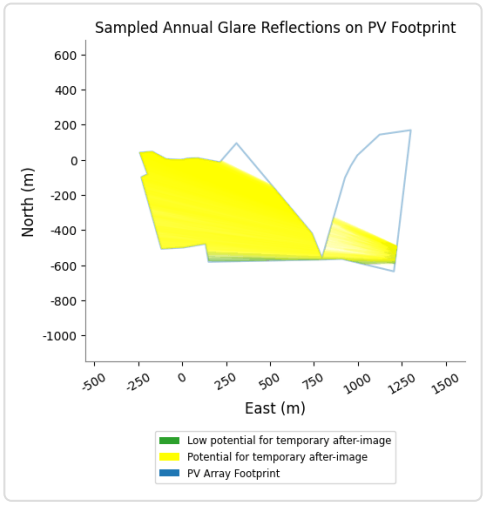
Yellow glare: 3,910 min.

Green glare: 1,006 min.





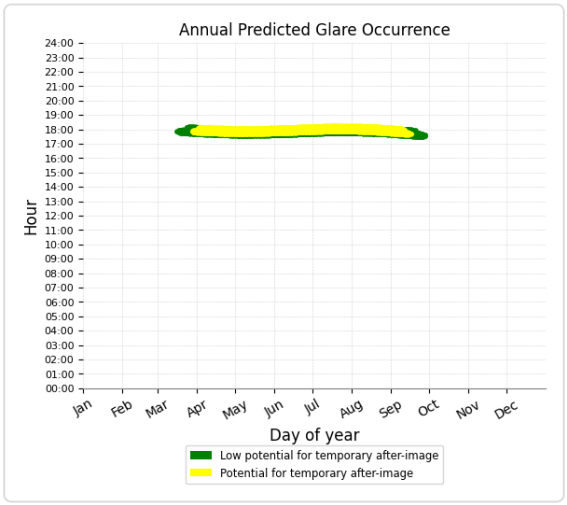


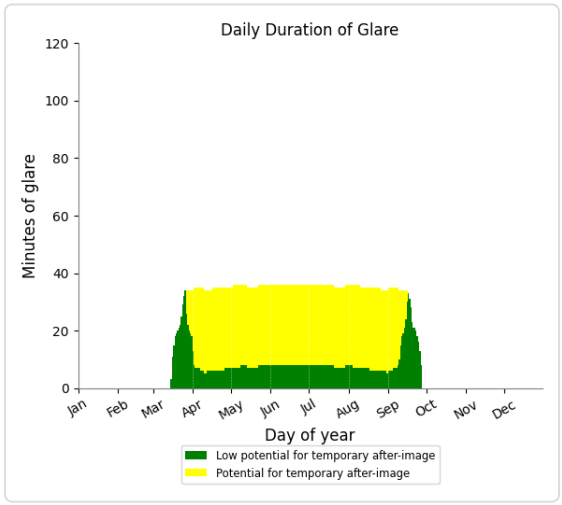


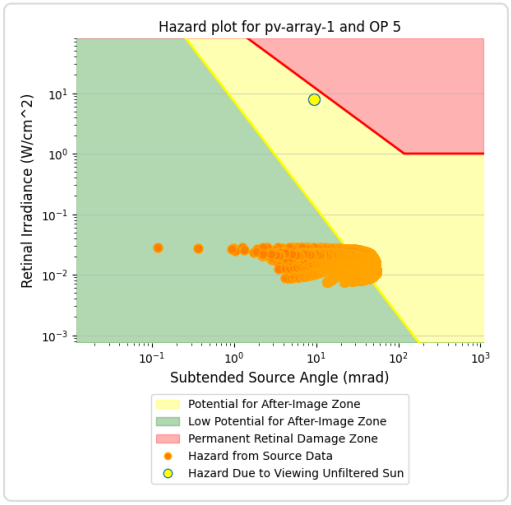
PV array 1 and OP 5

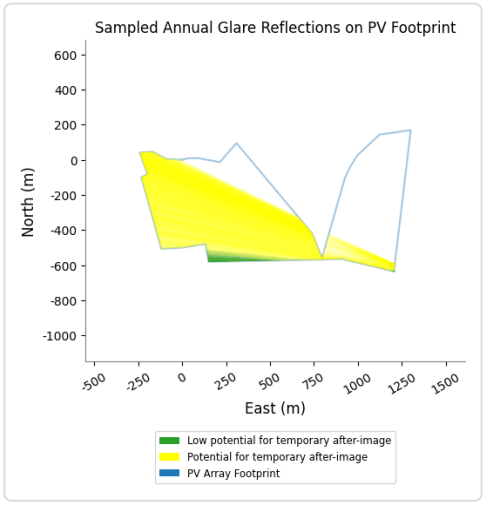
Yellow glare: 4,733 min.

Green glare: 1,894 min.





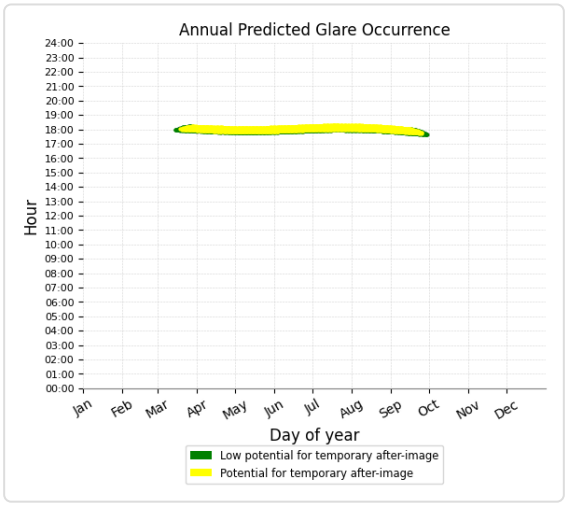


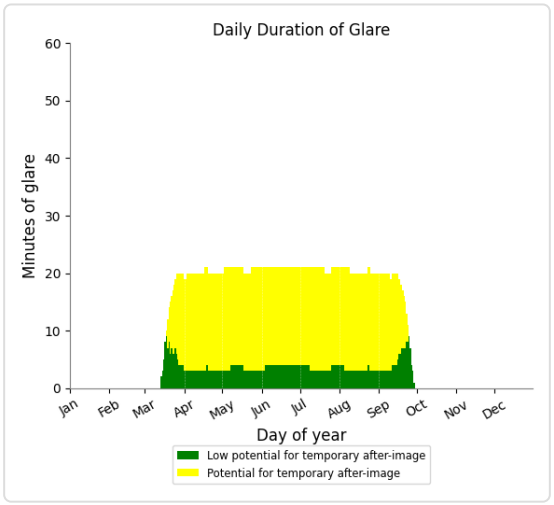


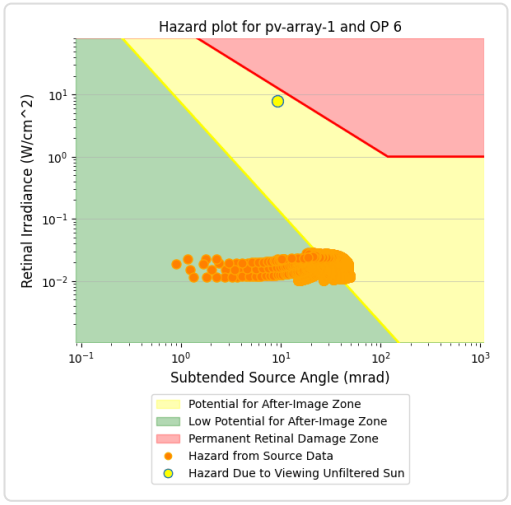
PV array 1 and OP 6

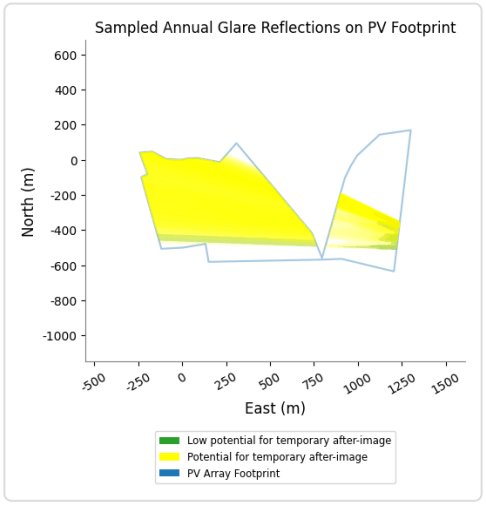
Yellow glare: 3,128 min.

Green glare: 751 min.





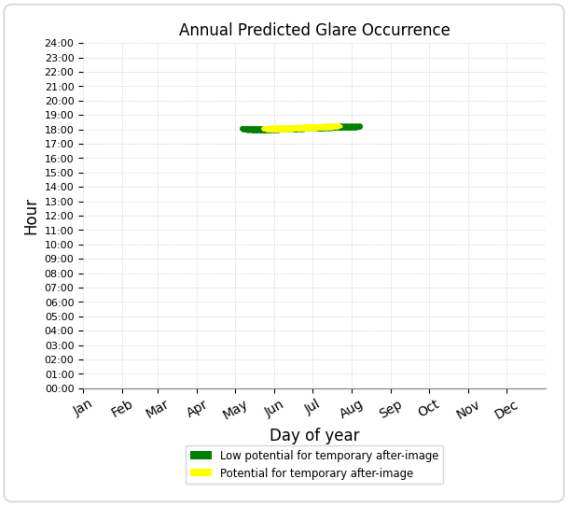


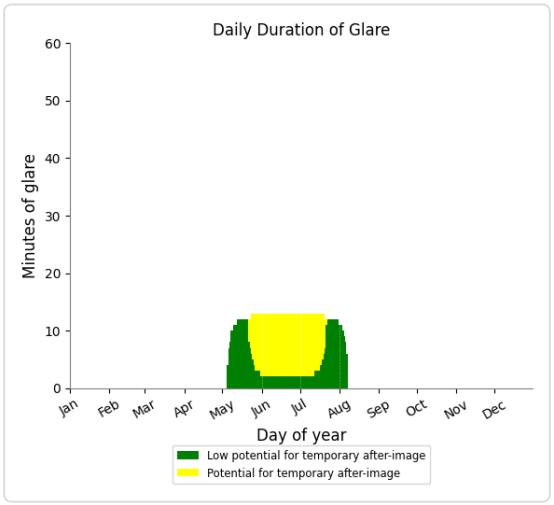


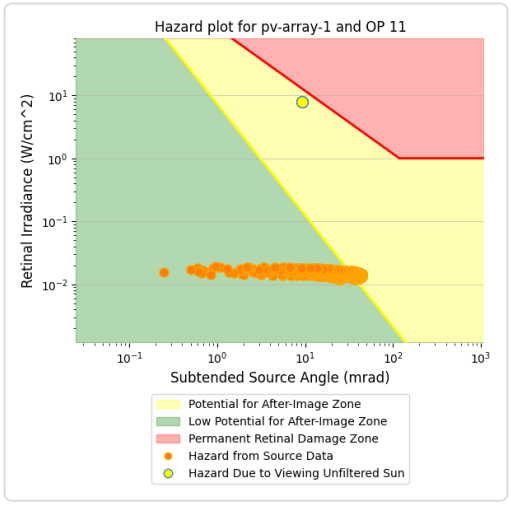
PV array 1 and OP 11

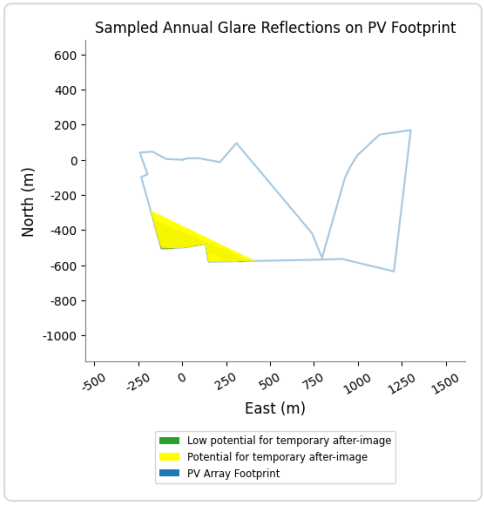
Yellow glare: 625 min.

Green glare: 531 min.





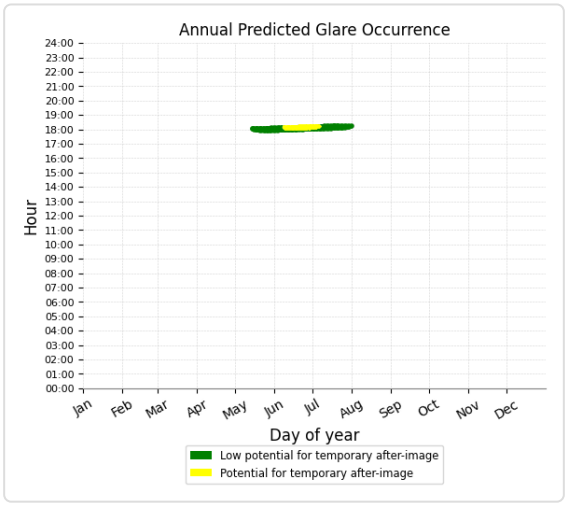


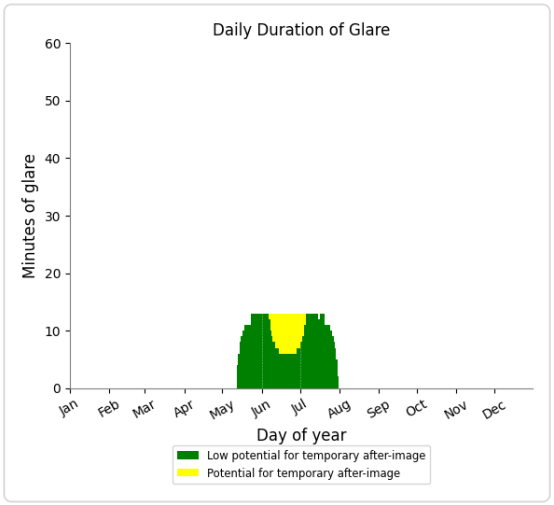


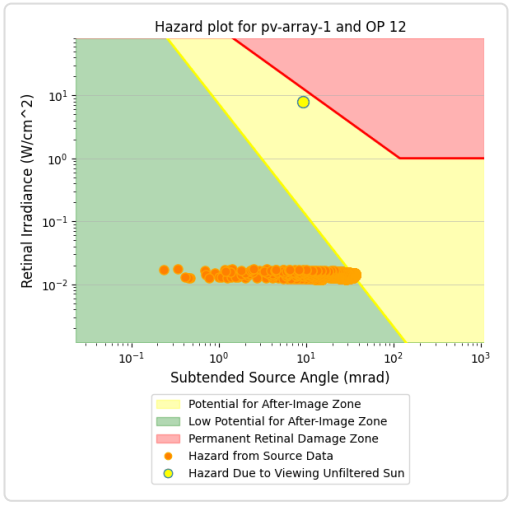
PV array 1 and OP 12

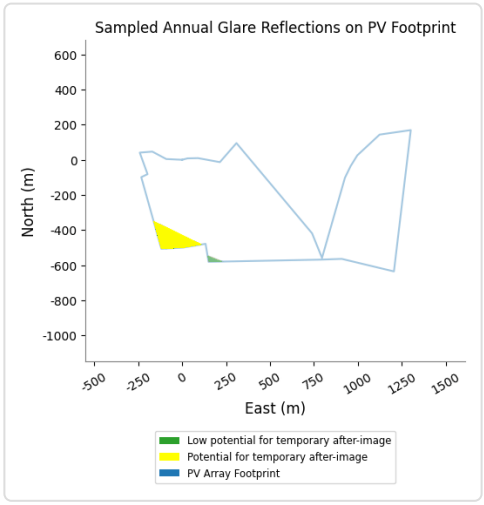
Yellow glare: 167 min.

Green glare: 783 min.





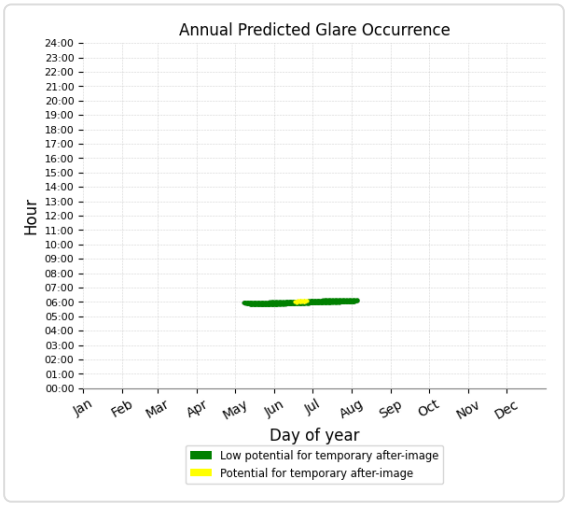


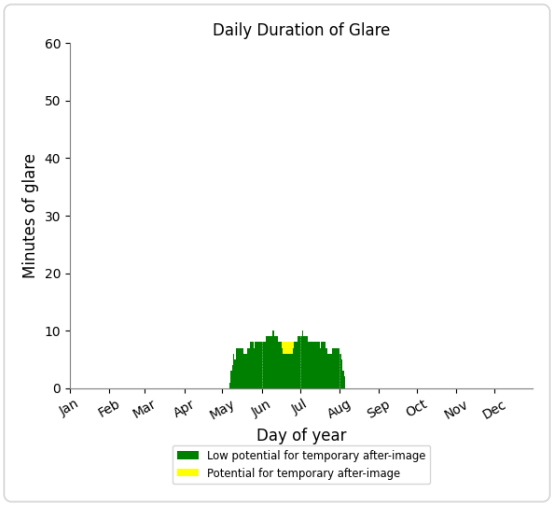


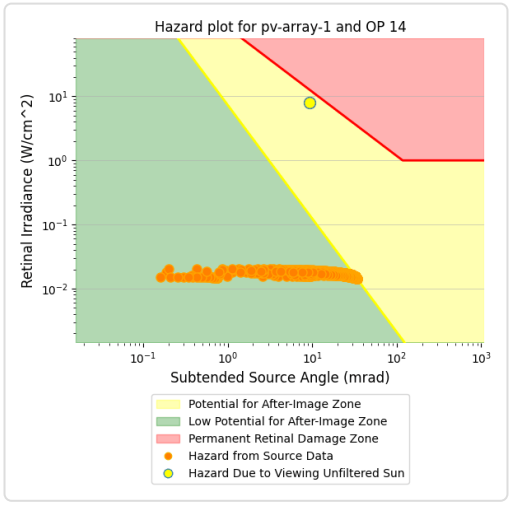
PV array 1 and OP 14

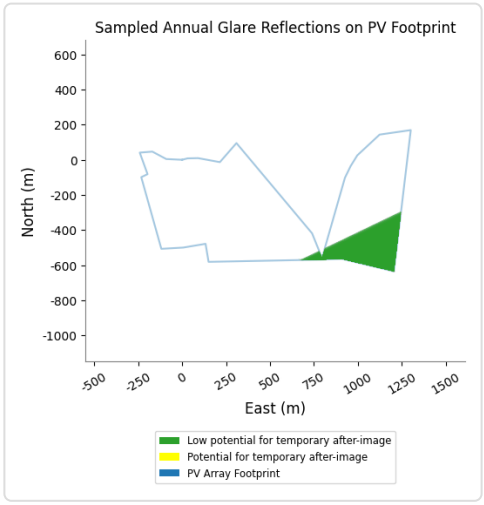
Yellow glare: 18 min.

Green glare: 661 min.





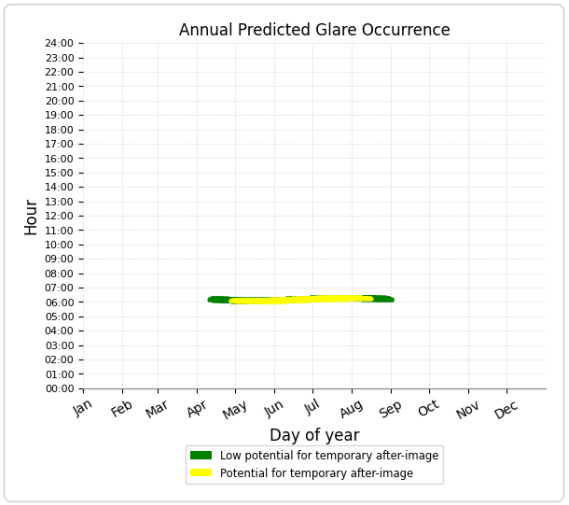


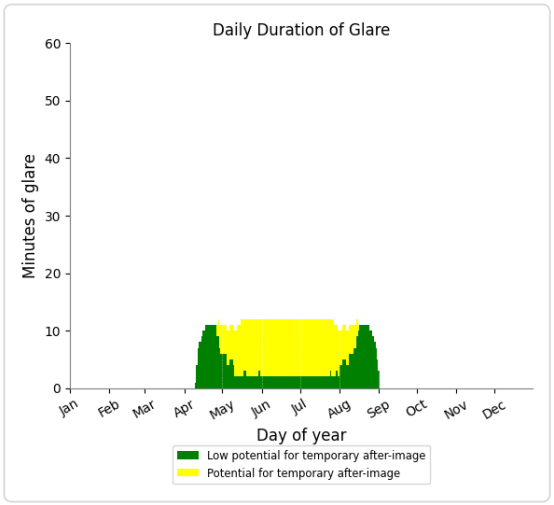


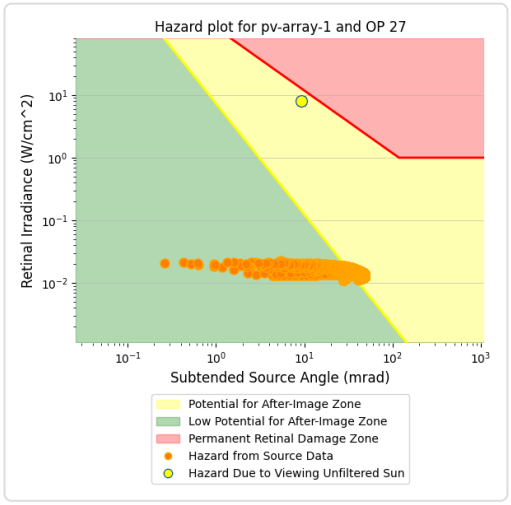
PV array 1 and OP 27

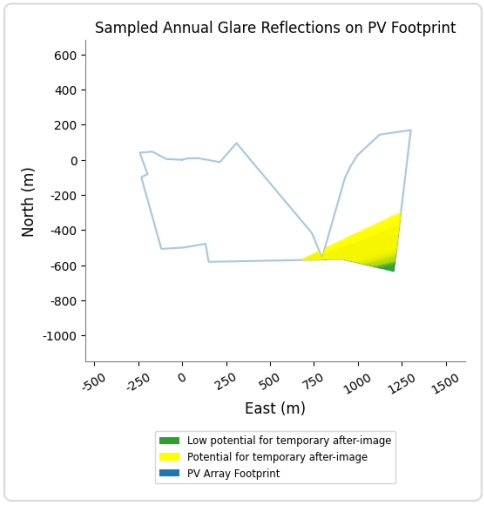
Yellow glare: 955 min.

Green glare: 646 min.





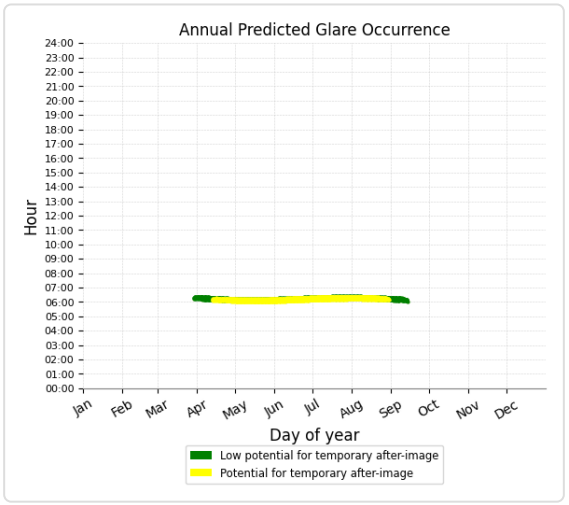


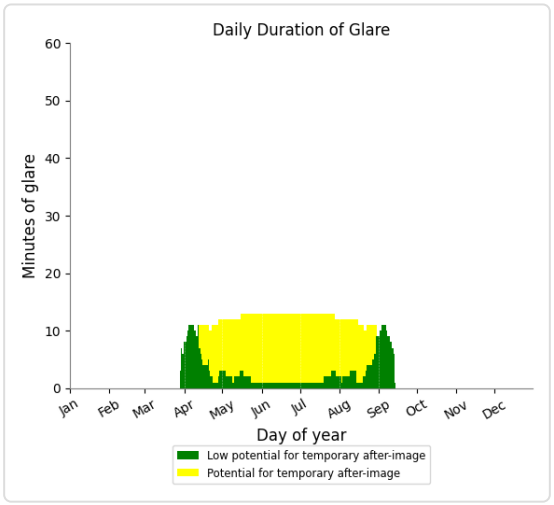


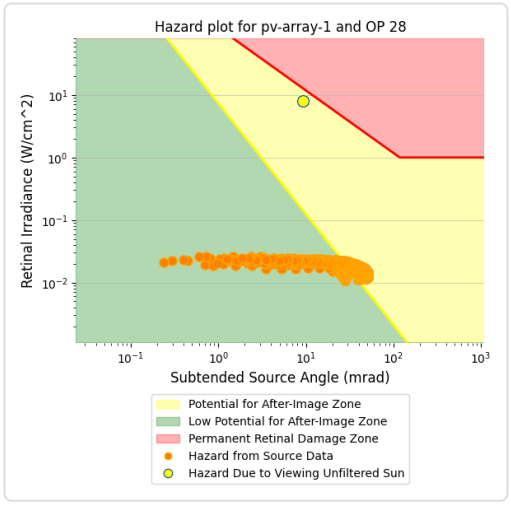
PV array 1 and OP 28

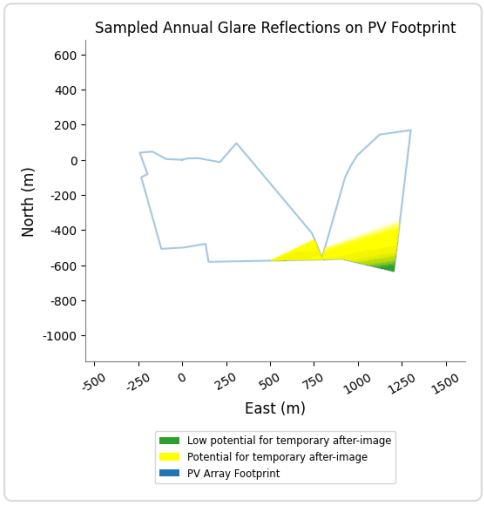
Yellow glare: 1,442 min.

Green glare: 542 min.





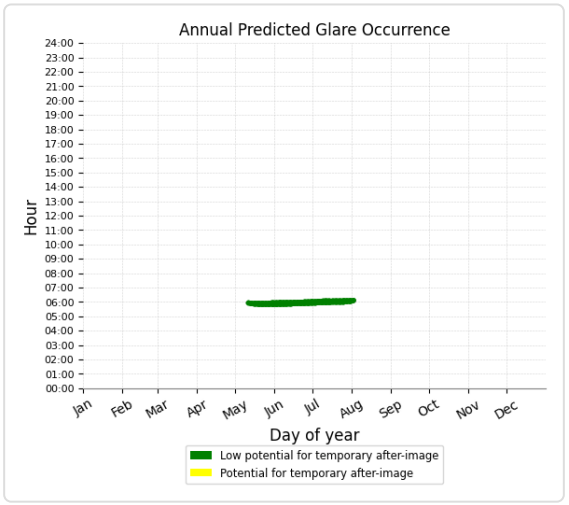


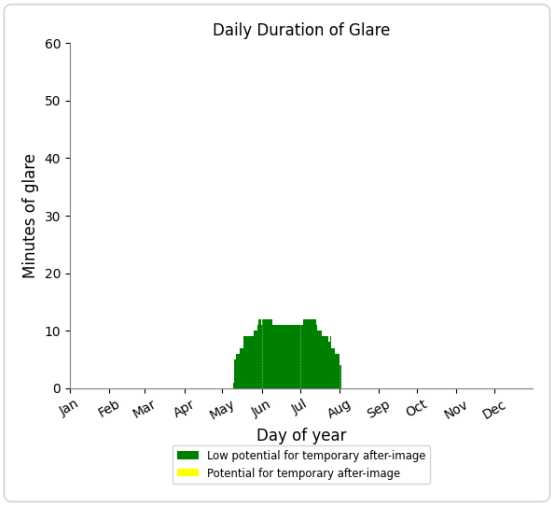


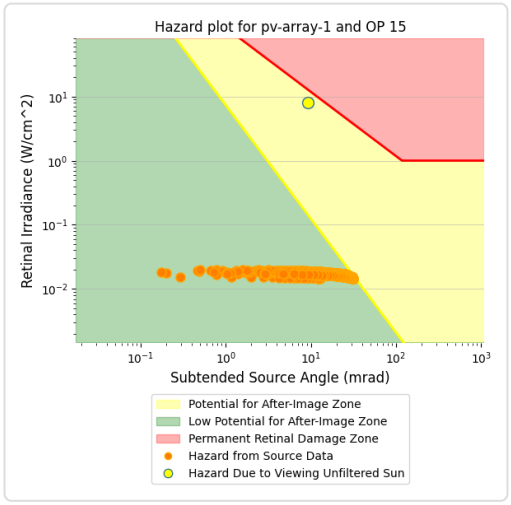
PV array 1 and OP 15

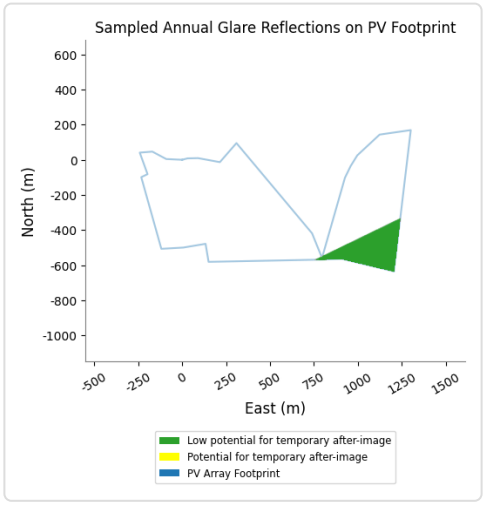
Yellow glare: none

Green glare: 835 min.





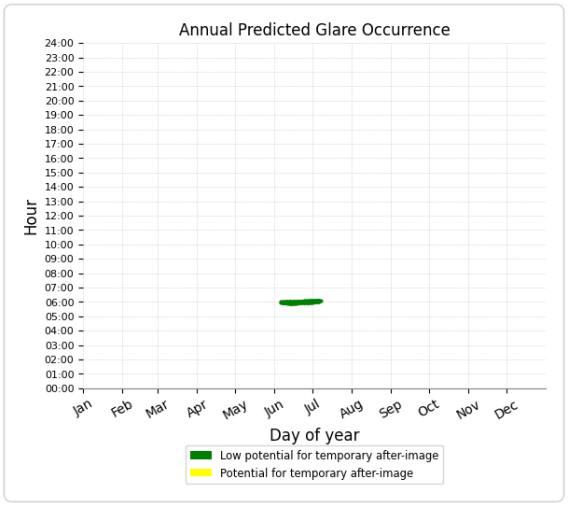


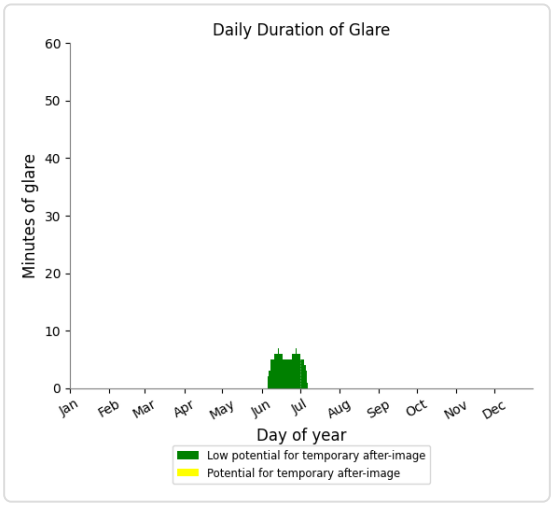


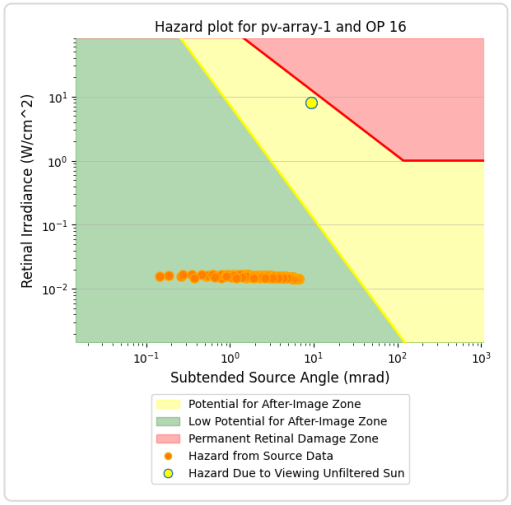
PV array 1 and OP 16

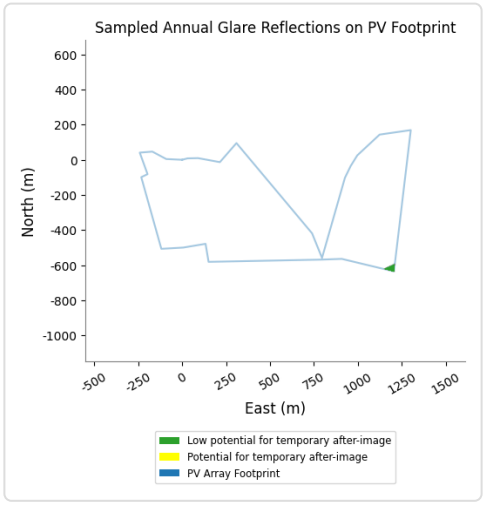
Yellow glare: none

Green glare: 164 min.





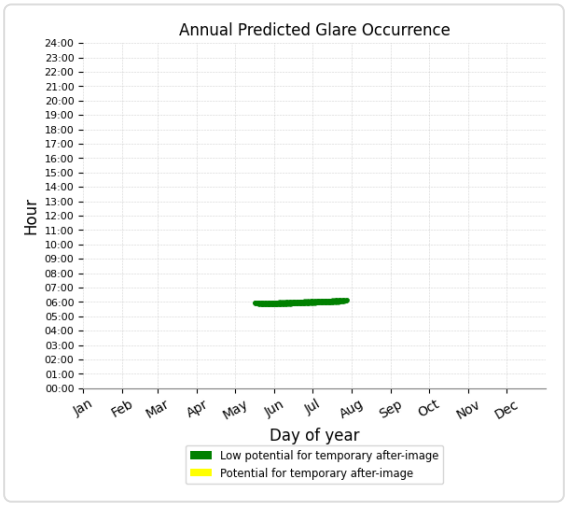


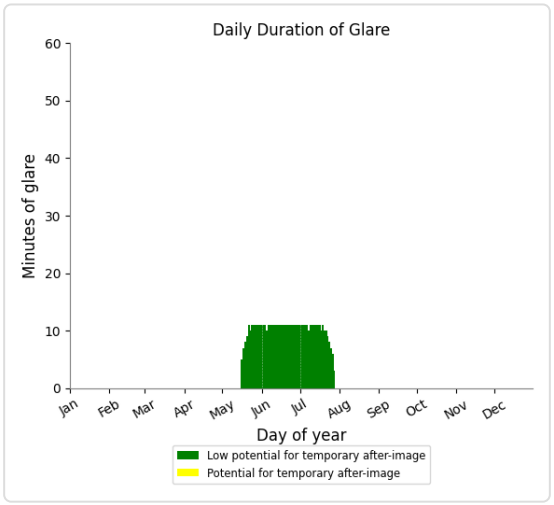


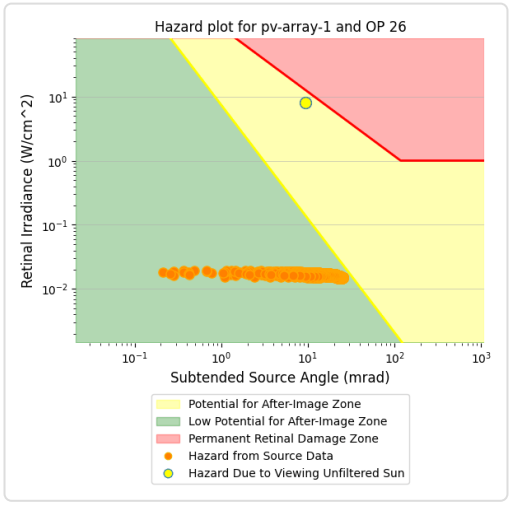
PV array 1 and OP 26

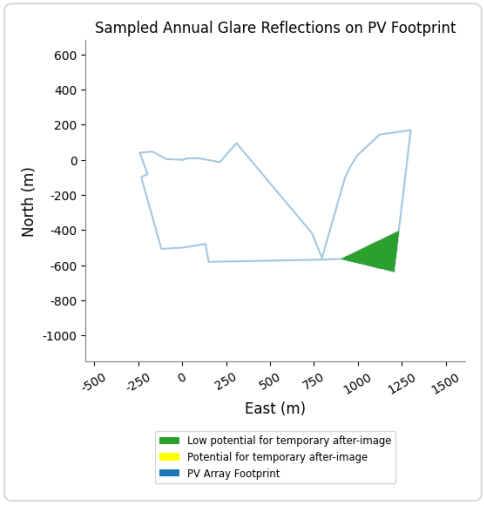
Yellow glare: none

Green glare: 760 min.



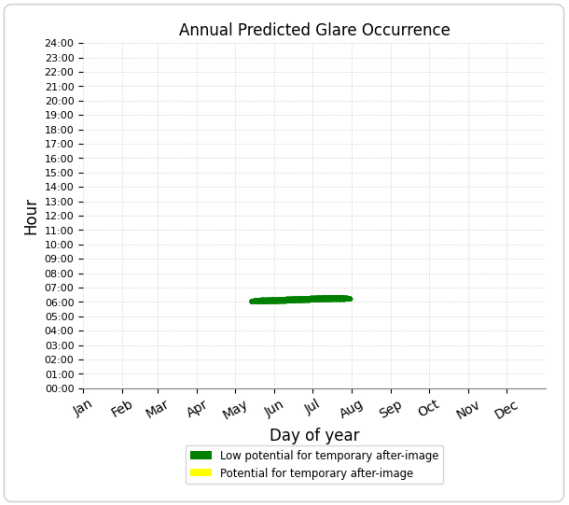


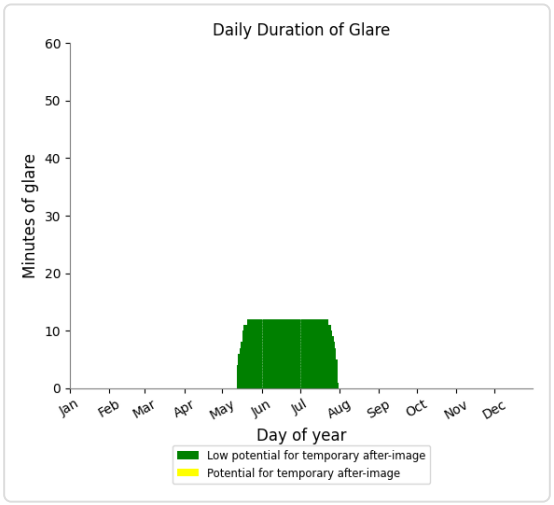


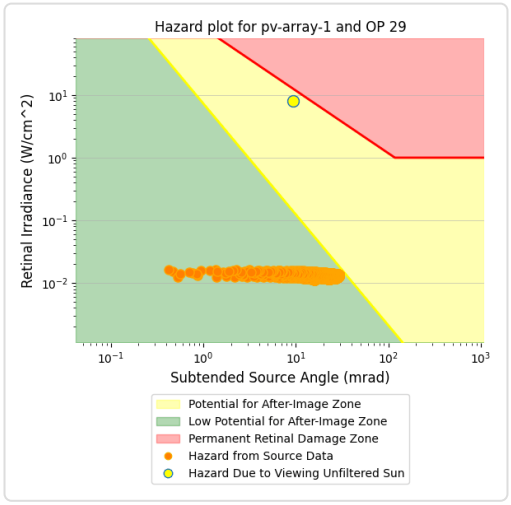


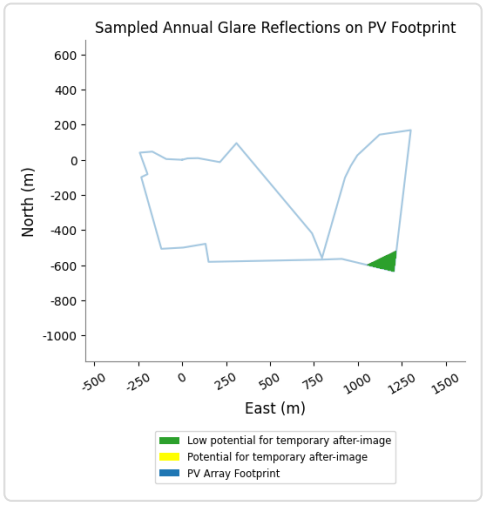
PV array 1 and OP 29

Yellow glare: none
Green glare: 898 min.









PV array 1 and OP 2

No glare found

PV array 1 and OP 7

No glare found

PV array 1 and OP 8

No glare found

PV array 1 and OP 9

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 13

No glare found

PV array 1 and OP 17

No glare found

PV array 1 and OP 18

No glare found

PV array 1 and OP 19

No glare found

PV array 1 and OP 20

No glare found

PV array 1 and OP 21

No glare found

PV array 1 and OP 22

No glare found

PV array 1 and OP 23

No glare found

PV array 1 and OP 24

No glare found

PV array 1 and OP 25

No glare found

PV: PV array 2 potential temporary after-image

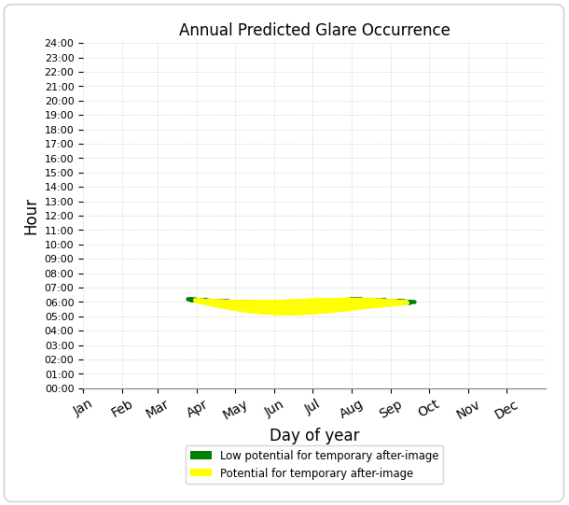
Receptor results ordered by category of glare

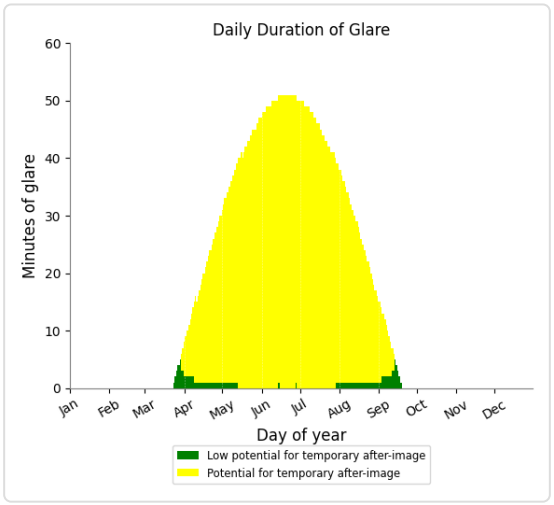
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	153	2.5	5,611	93.5
Route 3	146,578	2,443.0	68,520	1,142.0
Route 4	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
OP 8	948	15.8	283	4.7
OP 9	1,607	26.8	362	6.0
OP 10	1,458	24.3	626	10.4
OP 14	329	5.5	1,805	30.1
OP 15	710	11.8	2,973	49.5
OP 16	387	6.5	2,035	33.9
OP 19	651	10.8	849	14.2
OP 21	1,026	17.1	449	7.5
OP 22	384	6.4	1,928	32.1
OP 23	782	13.0	858	14.3
OP 24	753	12.6	137	2.3
OP 25	698	11.6	25	0.4
OP 26	1,165	19.4	2,195	36.6
OP 2	580	9.7	0	0.0
OP 7	424	7.1	0	0.0
OP 13	553	9.2	0	0.0
OP 29	21	0.3	0	0.0
OP 1	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0

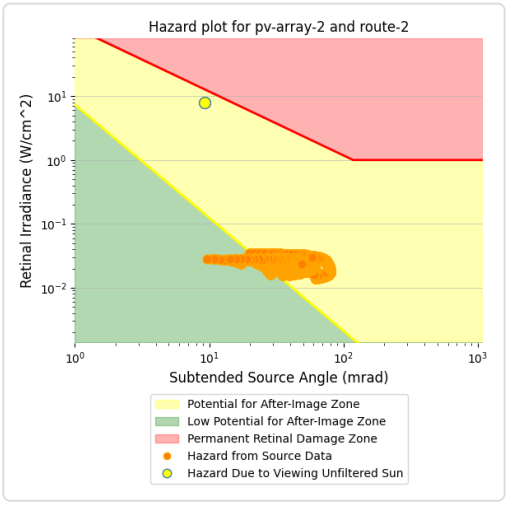
PV array 2 and Route: Route 1

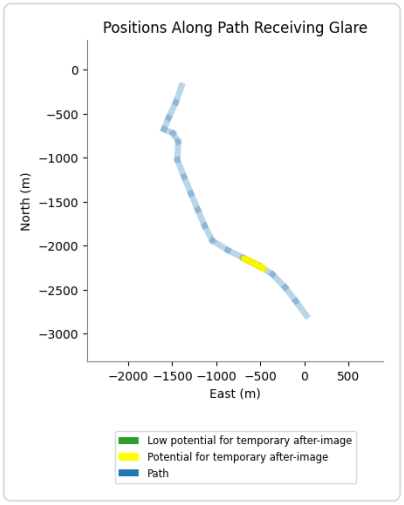
Yellow glare: 5,611 min.

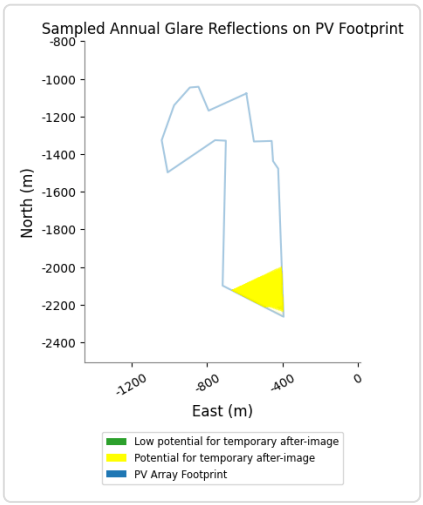
Green glare: 153 min.







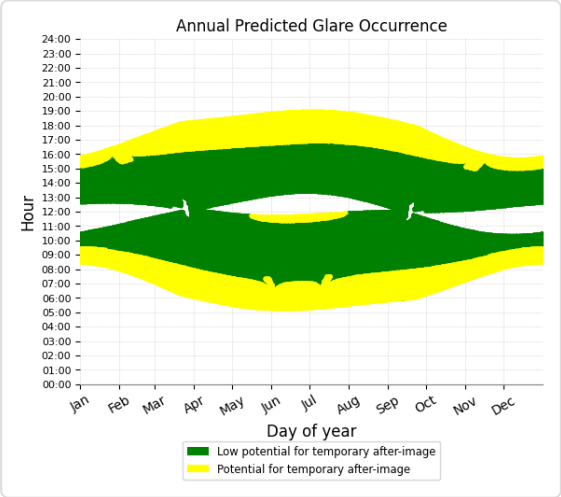


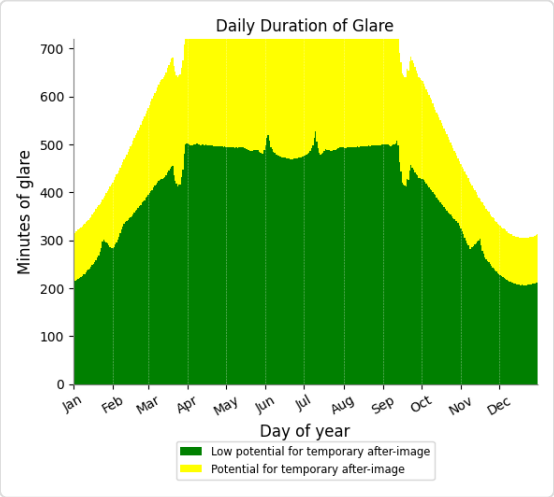


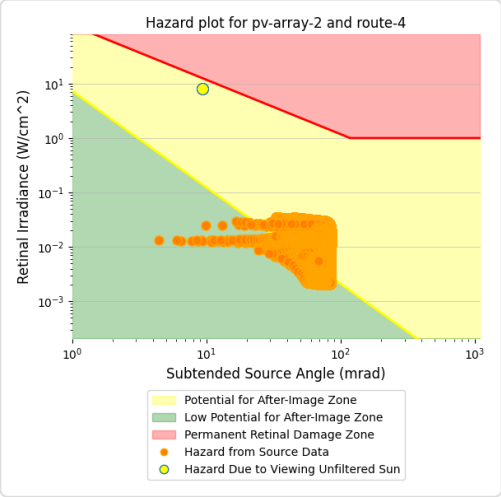
PV array 2 and Route: Route 3

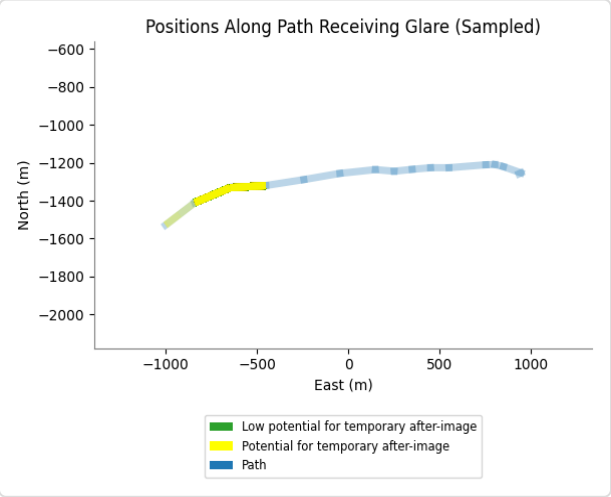
Yellow glare: 68,520 min.

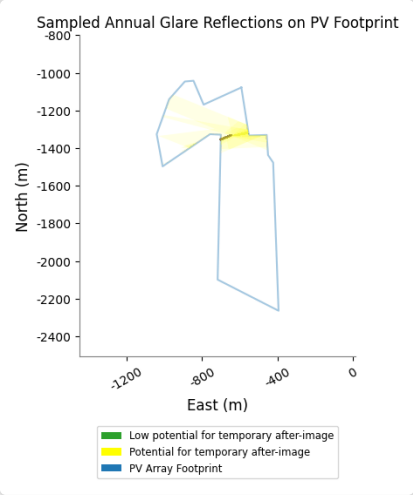
Green glare: 146,578 min.











PV array 2 and Route: Route 4

No glare found

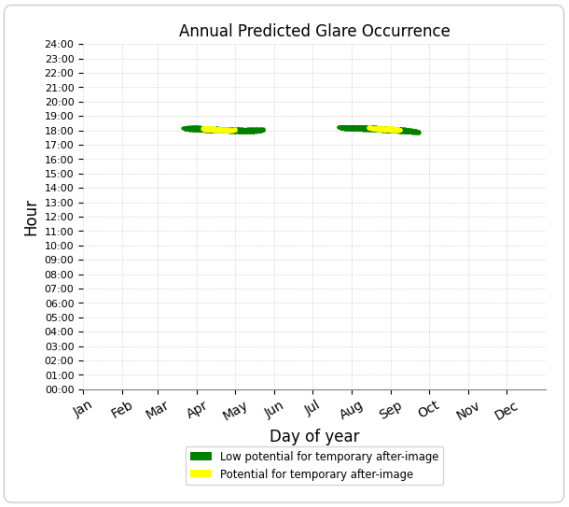
PV array 2 and Route: Route 2

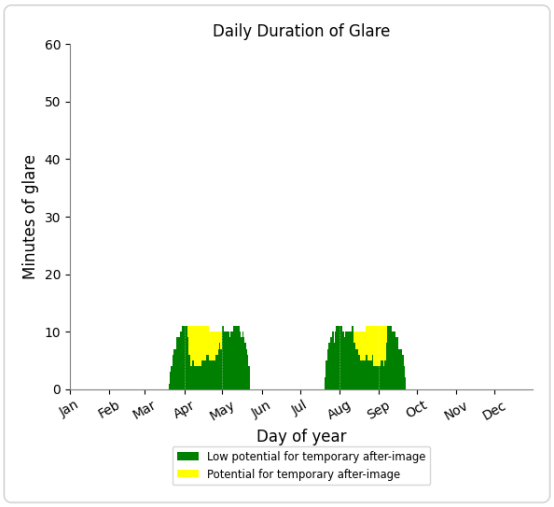
No glare found

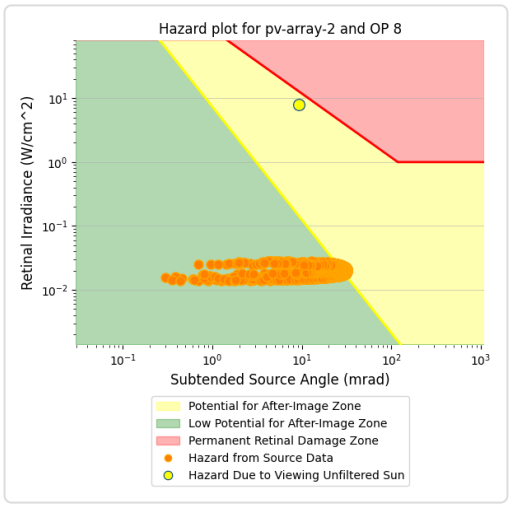
PV array 2 and OP 8

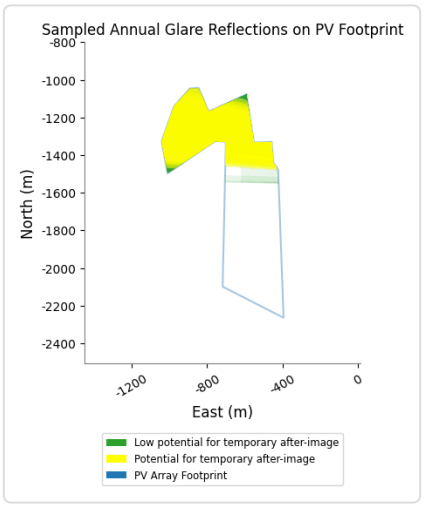
Yellow glare: 283 min.

Green glare: 948 min.





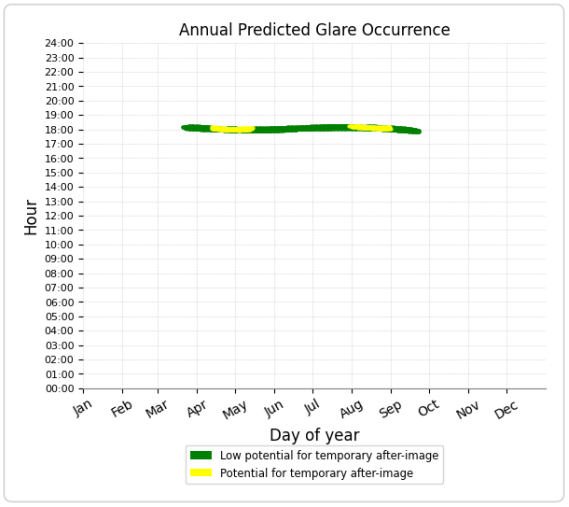


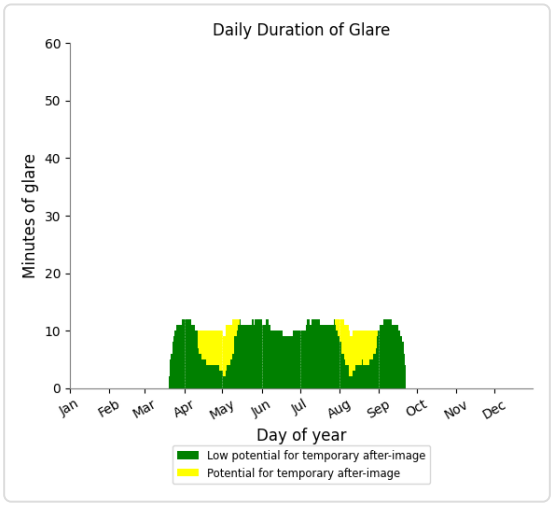


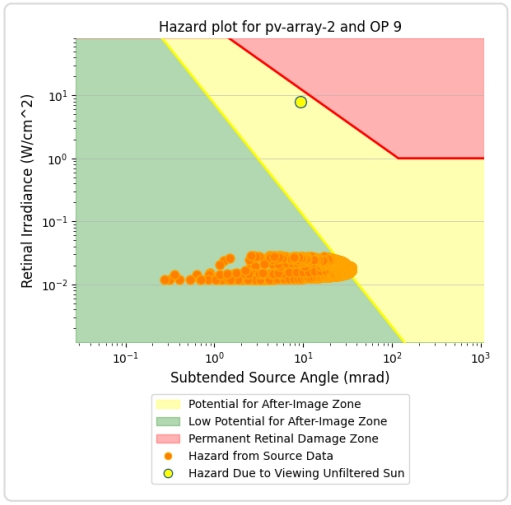
PV array 2 and OP 9

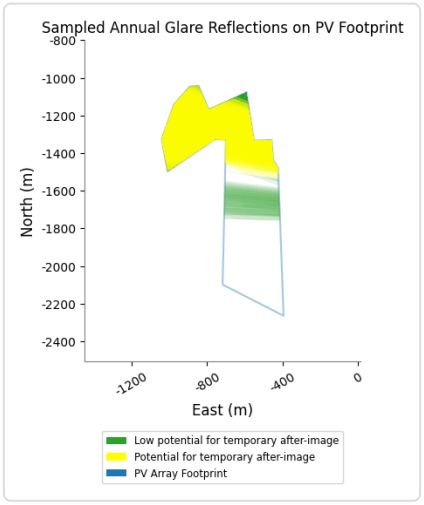
Yellow glare: 362 min.

Green glare: 1,607 min.





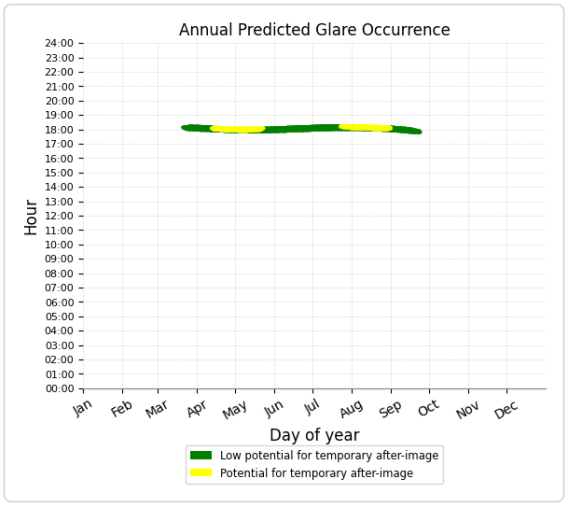


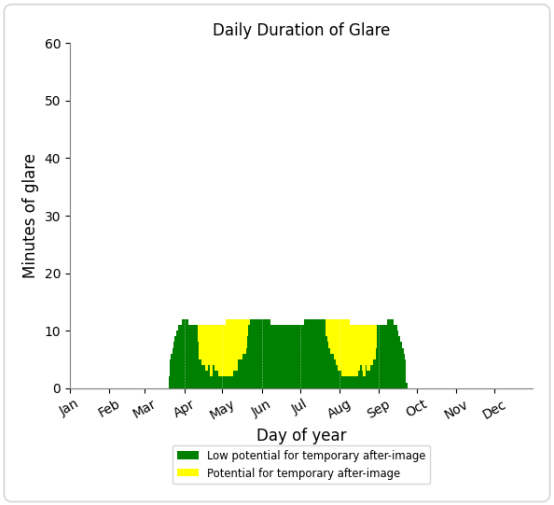


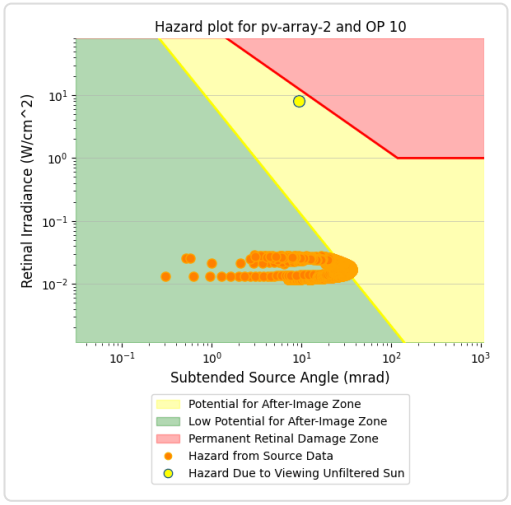
PV array 2 and OP 10

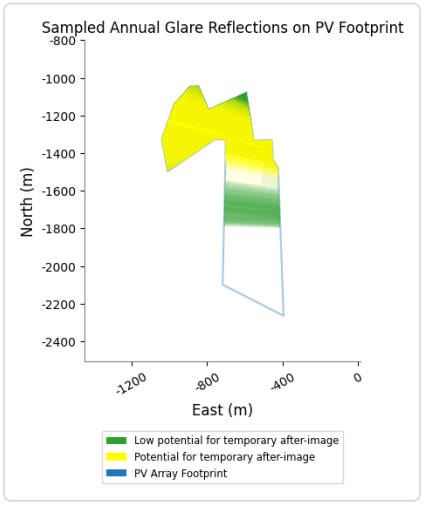
Yellow glare: 626 min.

Green glare: 1,458 min.





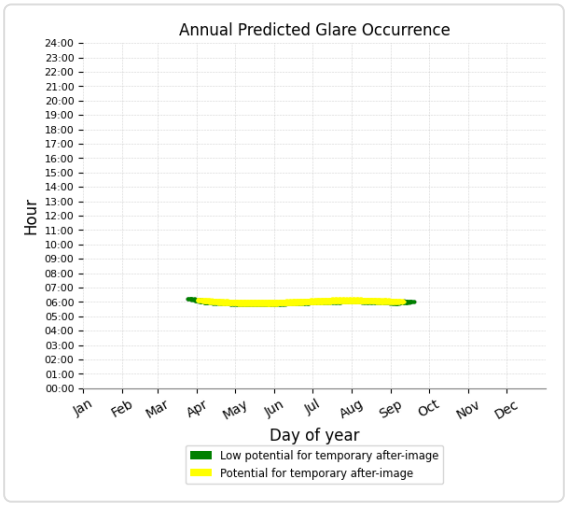


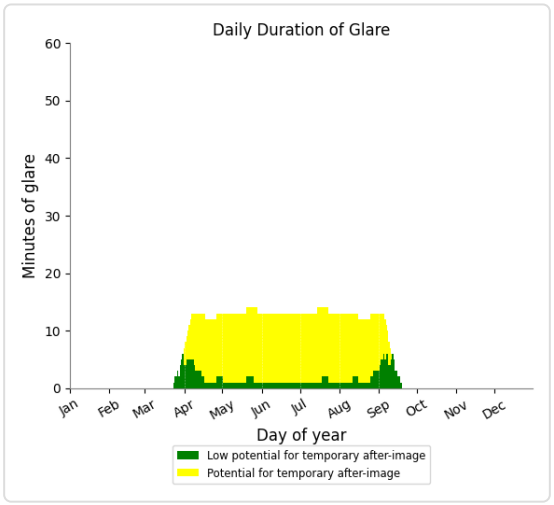


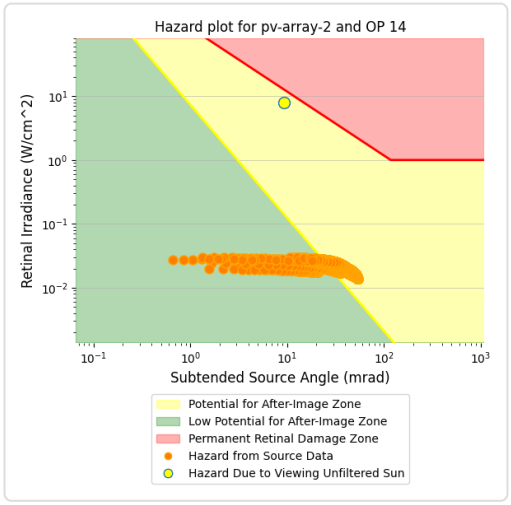
PV array 2 and OP 14

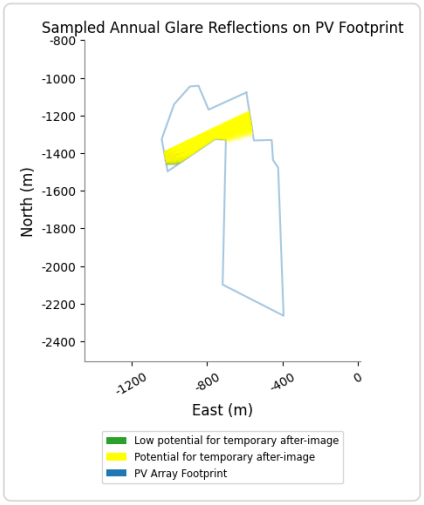
Yellow glare: 1,805 min.

Green glare: 329 min.





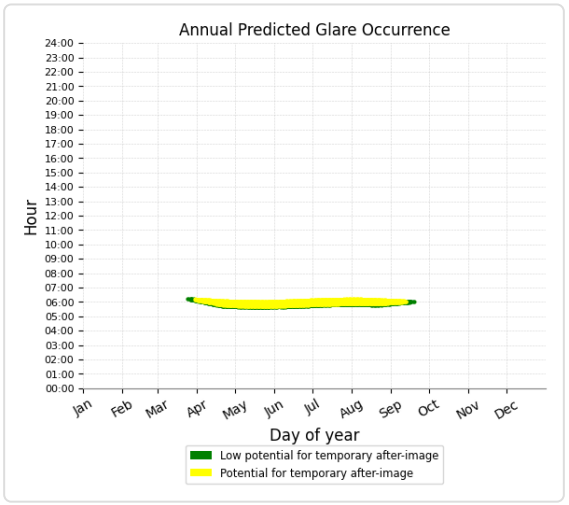


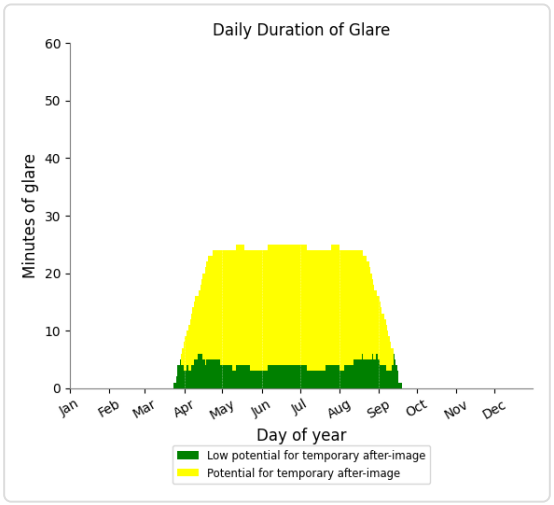


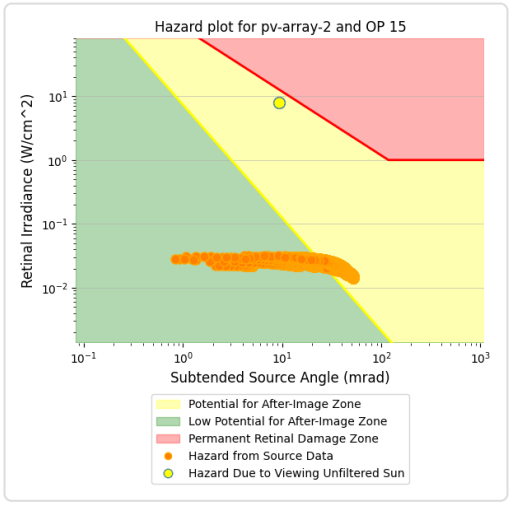
PV array 2 and OP 15

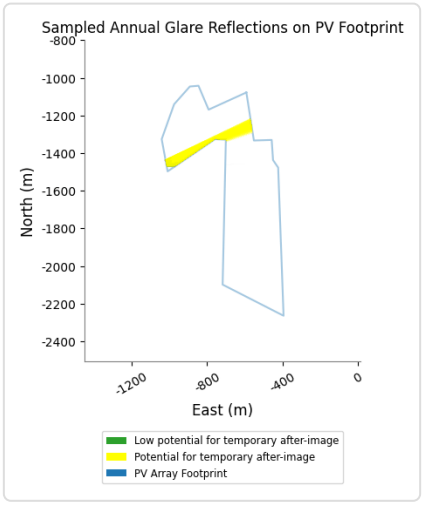
Yellow glare: 2,973 min.

Green glare: 710 min.





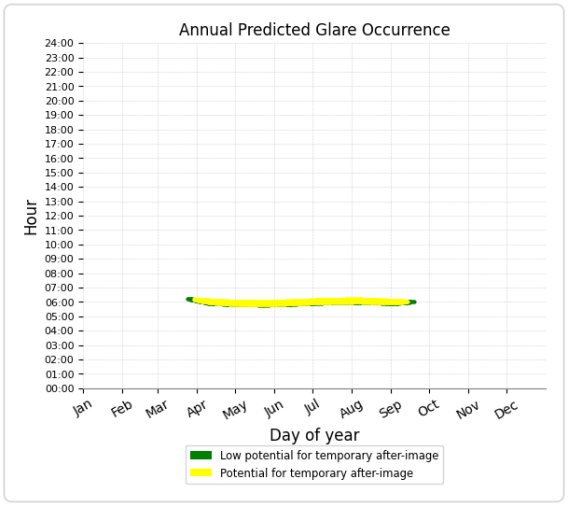


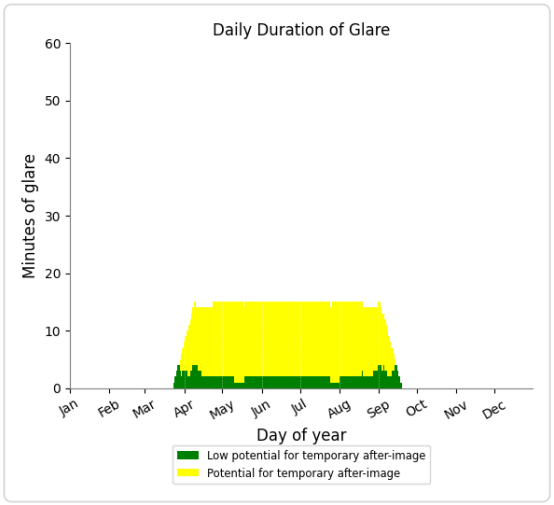


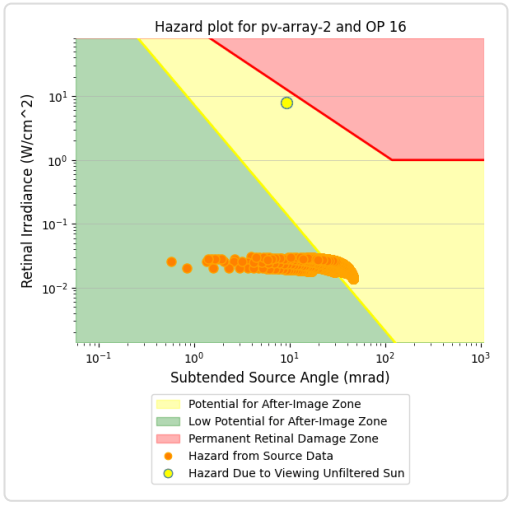
PV array 2 and OP 16

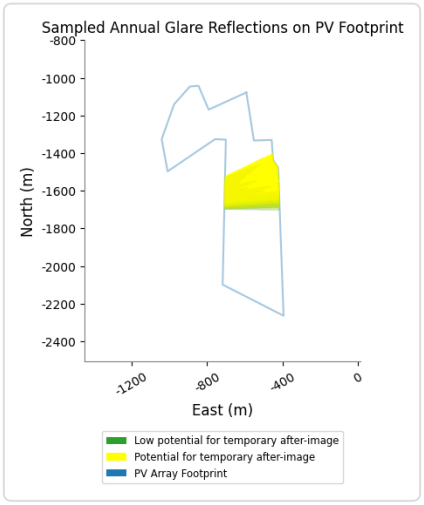
Yellow glare: 2,035 min.

Green glare: 387 min.





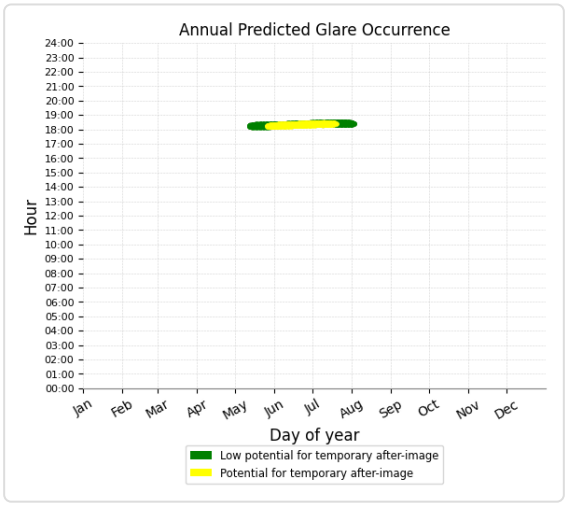


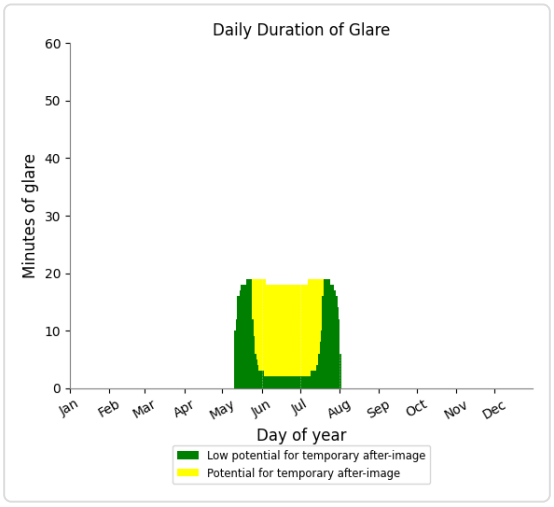


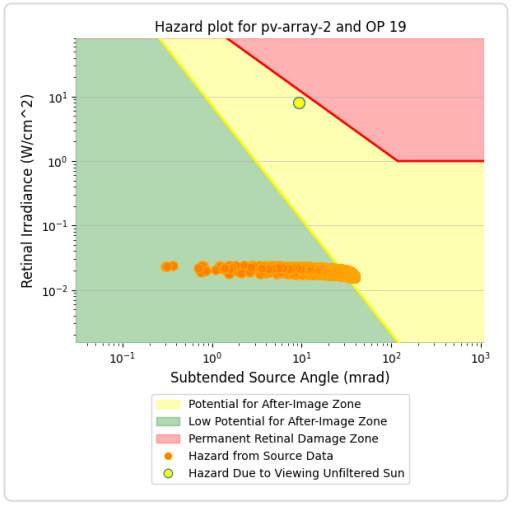
PV array 2 and OP 19

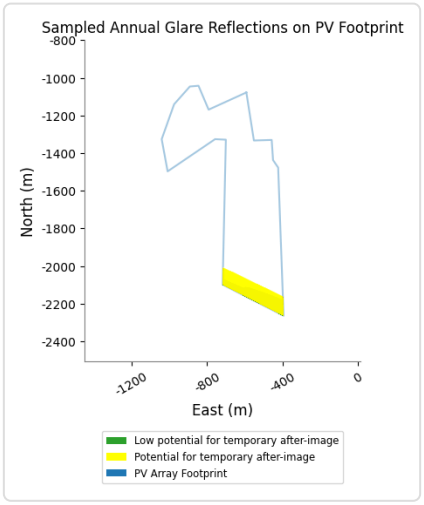
Yellow glare: 849 min.

Green glare: 651 min.





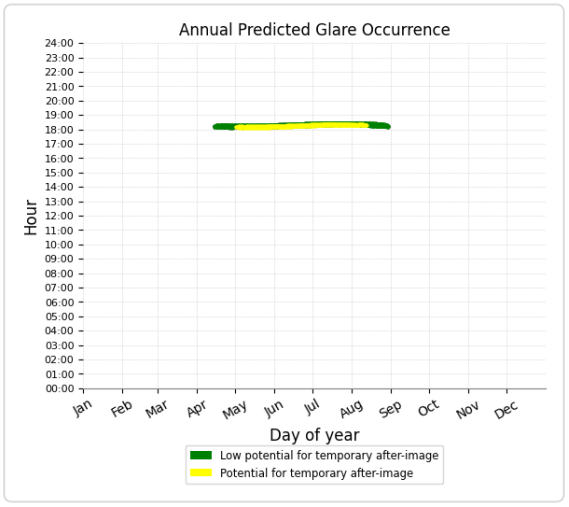


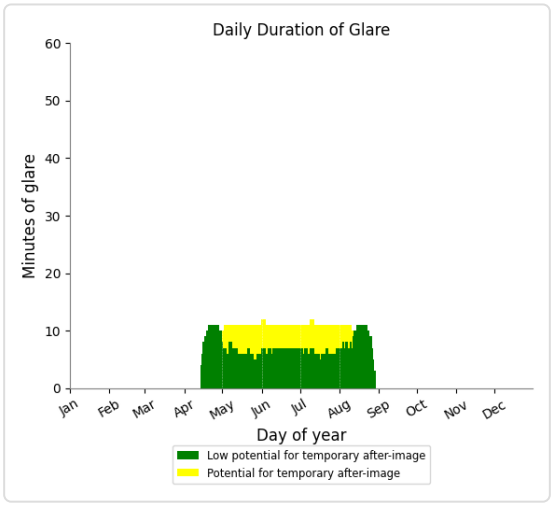


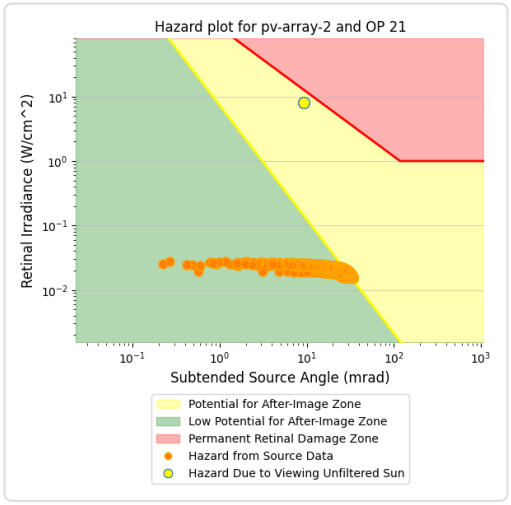
PV array 2 and OP 21

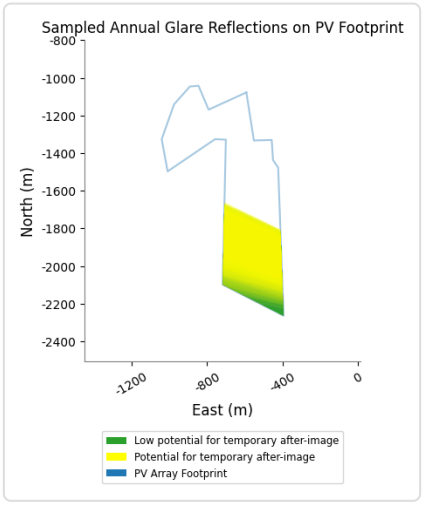
Yellow glare: 449 min.

Green glare: 1,026 min.





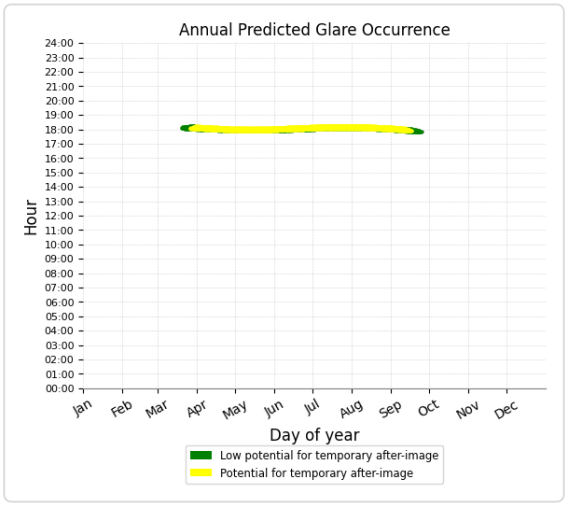


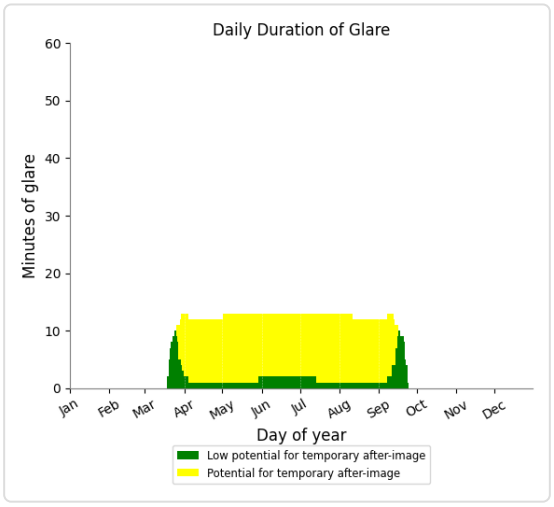


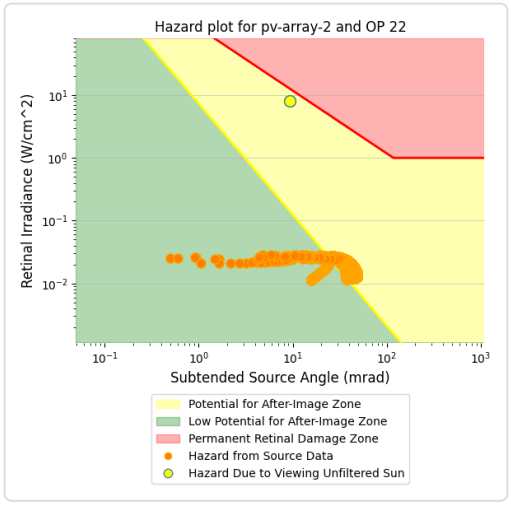
PV array 2 and OP 22

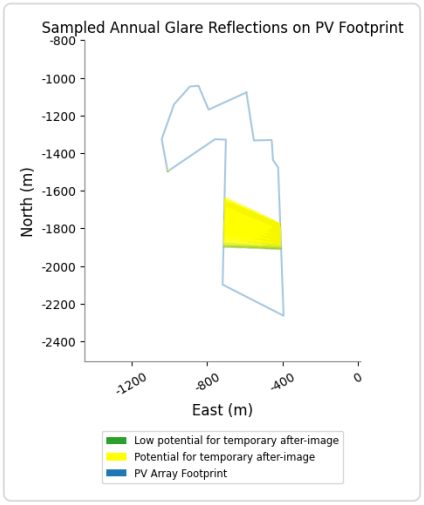
Yellow glare: 1,928 min.

Green glare: 384 min.





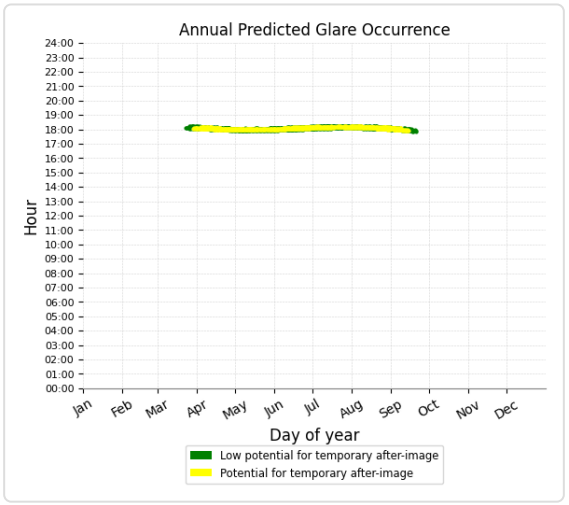


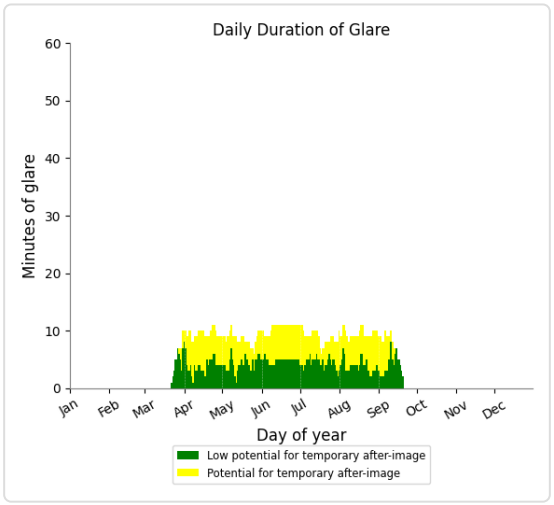


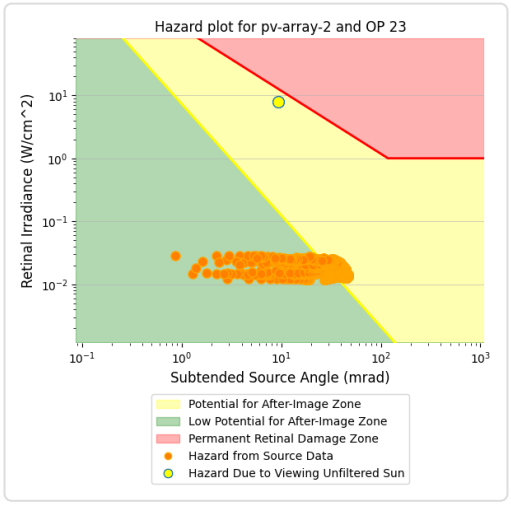
PV array 2 and OP 23

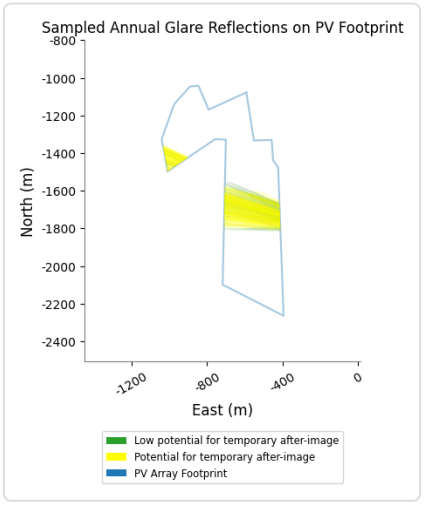
Yellow glare: 858 min.

Green glare: 782 min.





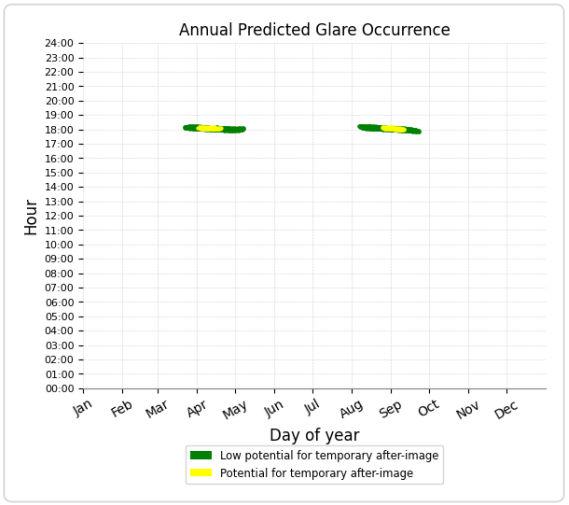


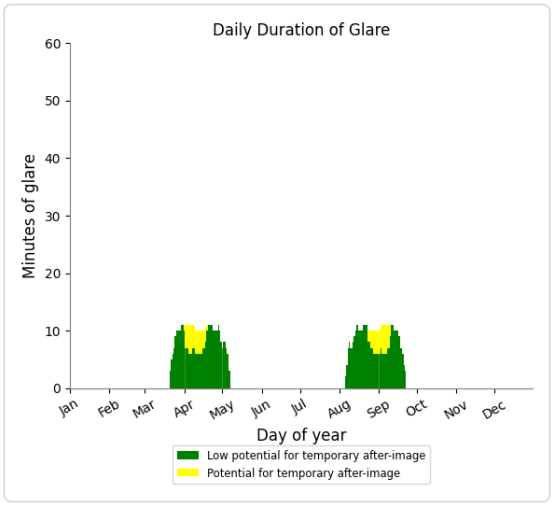


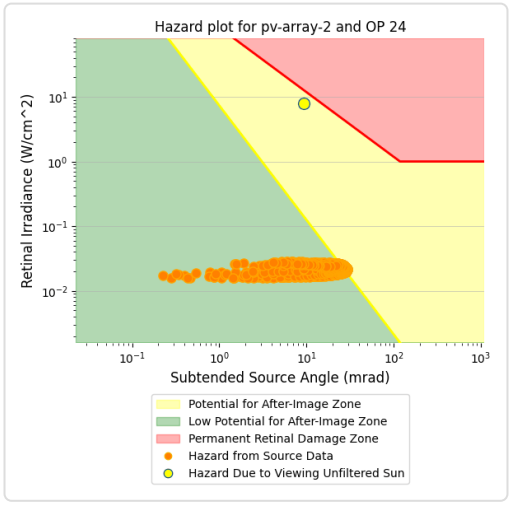
PV array 2 and OP 24

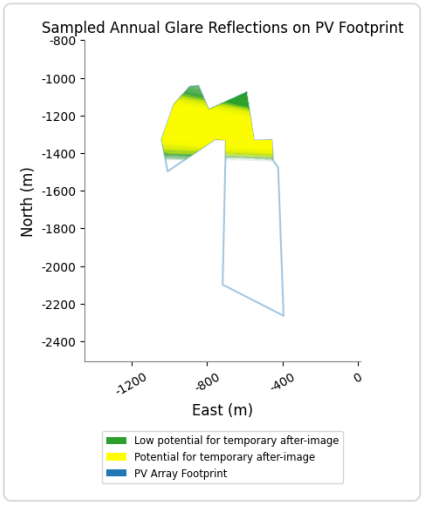
Yellow glare: 137 min.

Green glare: 753 min.





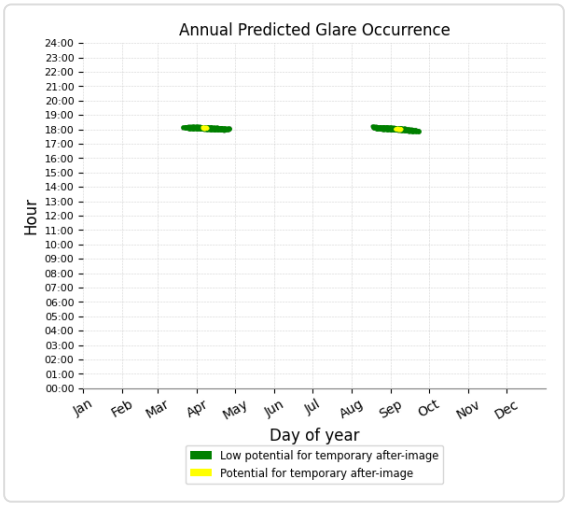


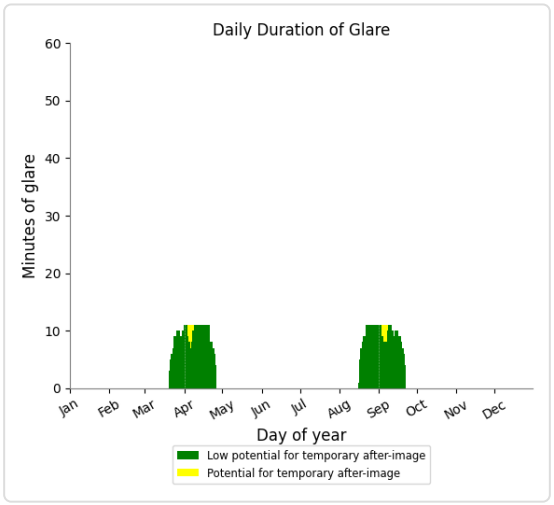


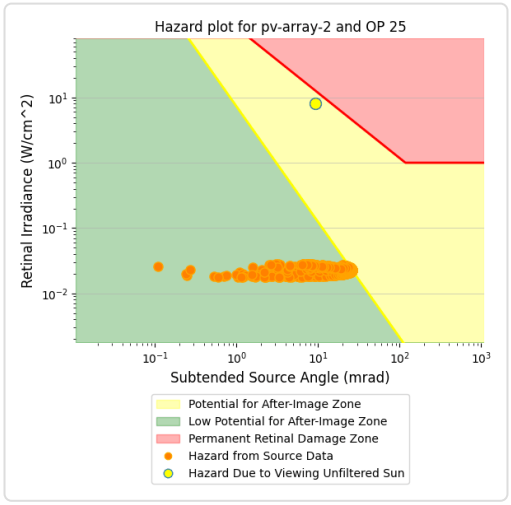
PV array 2 and OP 25

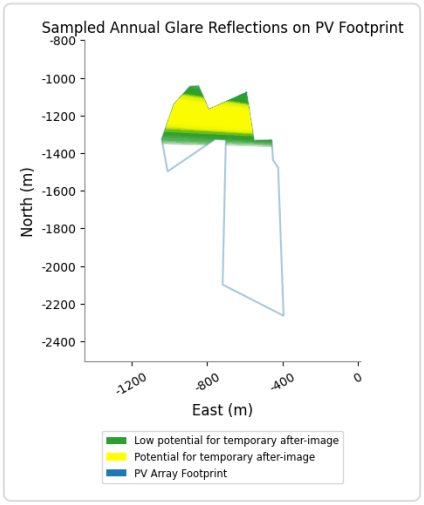
Yellow glare: 25 min.

Green glare: 698 min.





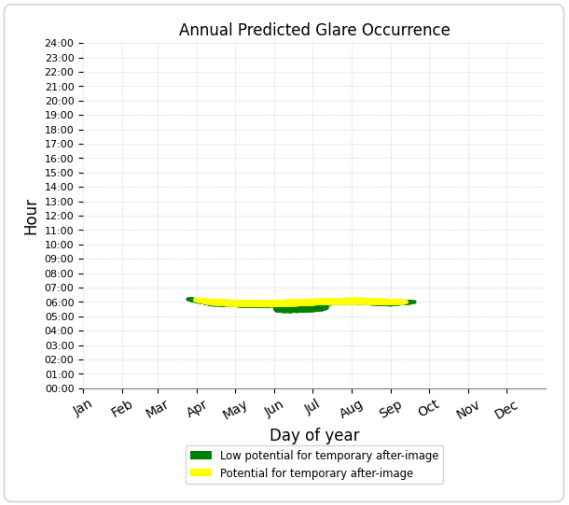


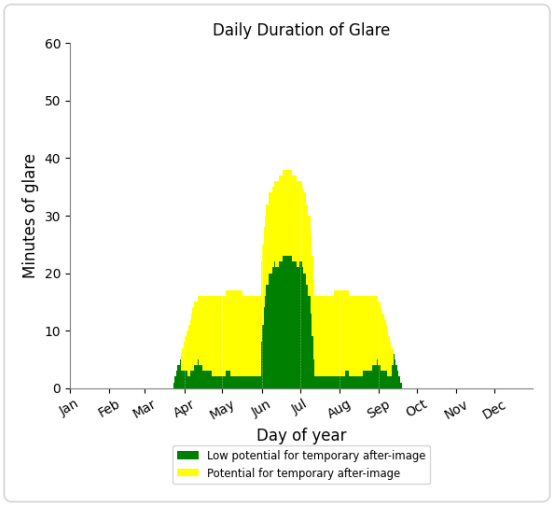


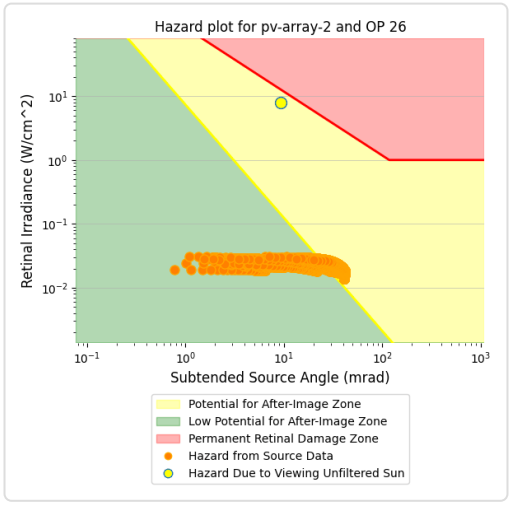
PV array 2 and OP 26

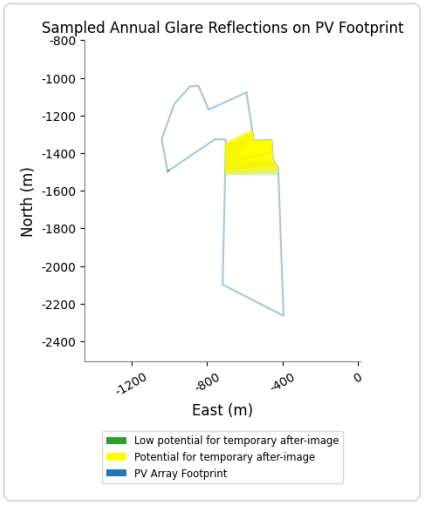
Yellow glare: 2,195 min.

Green glare: 1,165 min.





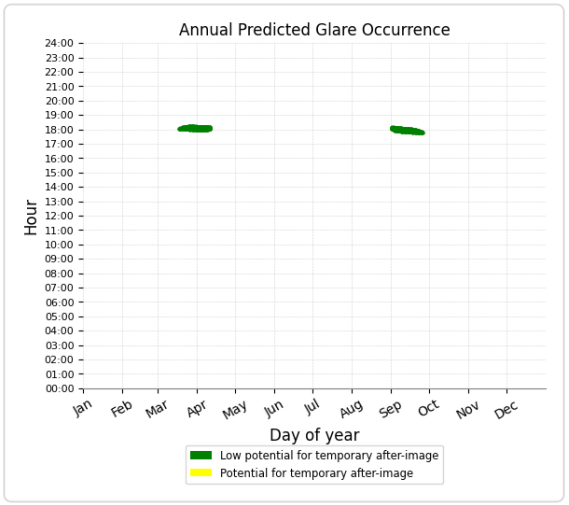


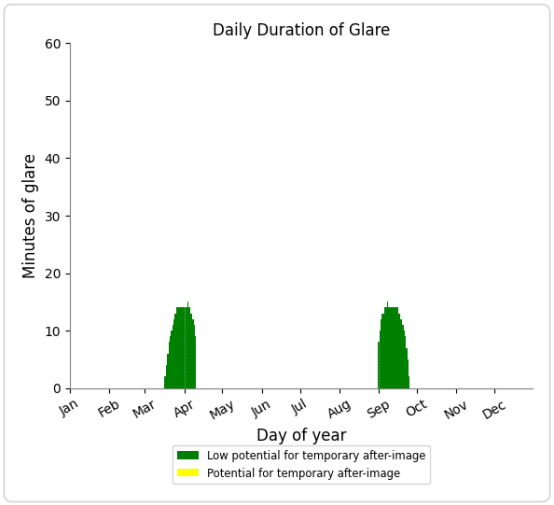


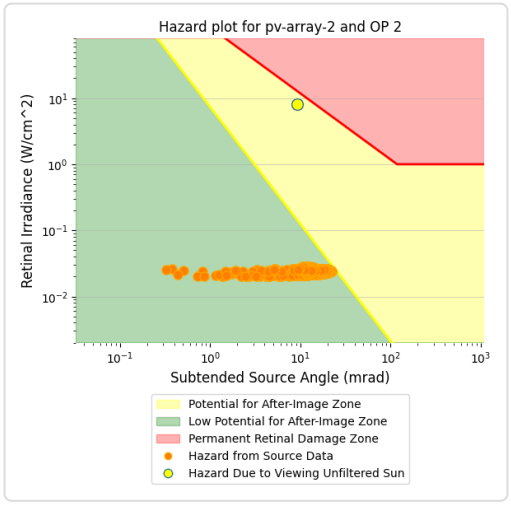
PV array 2 and OP 2

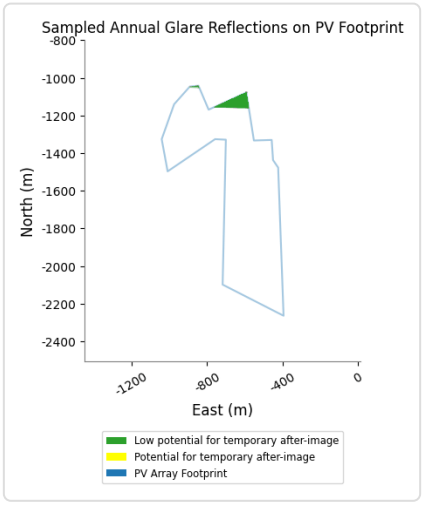
Yellow glare: none

Green glare: 580 min.





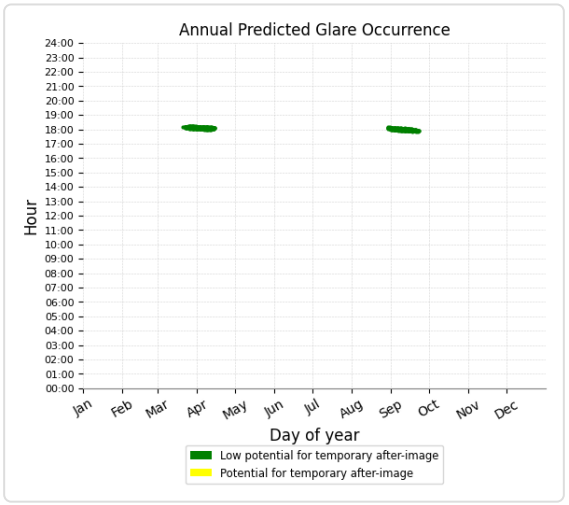


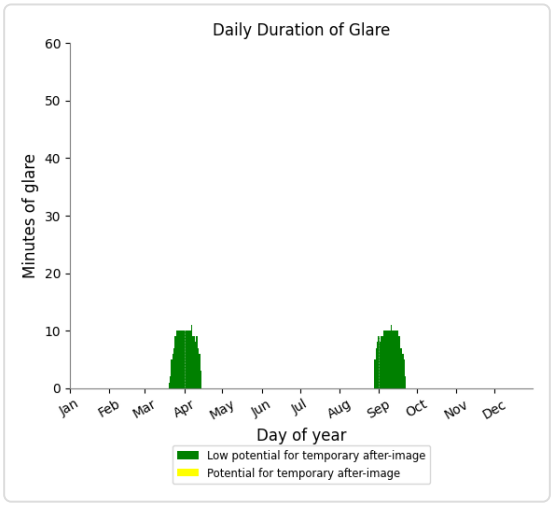


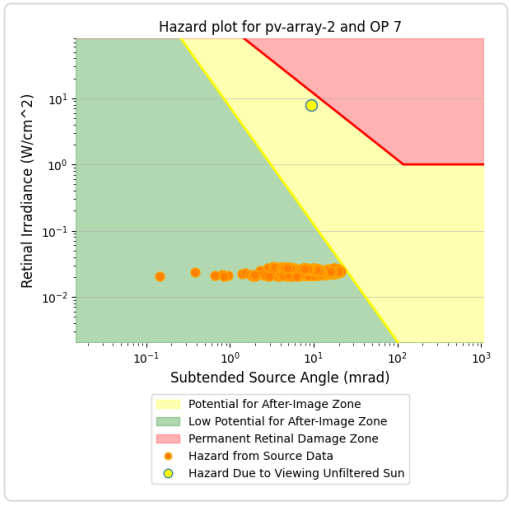
PV array 2 and OP 7

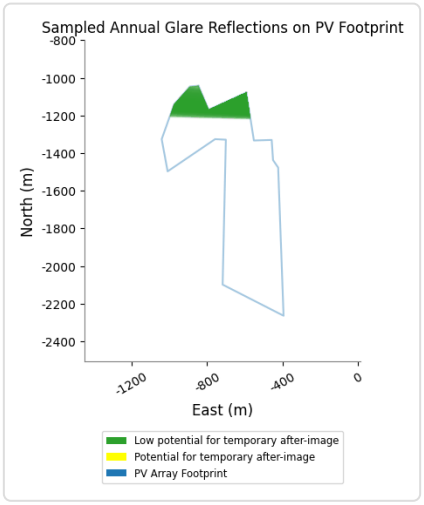
Yellow glare: none

Green glare: 424 min.





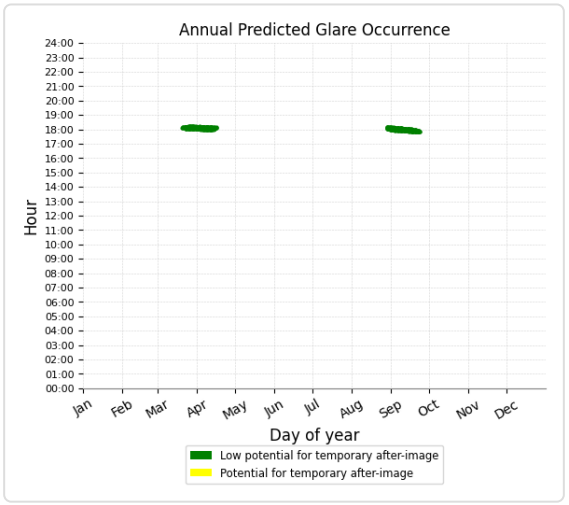


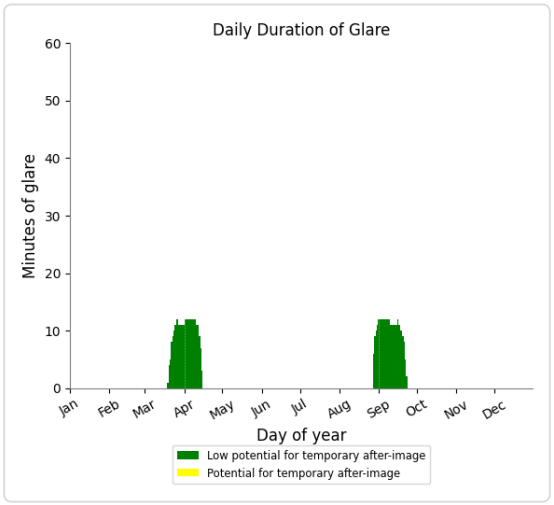


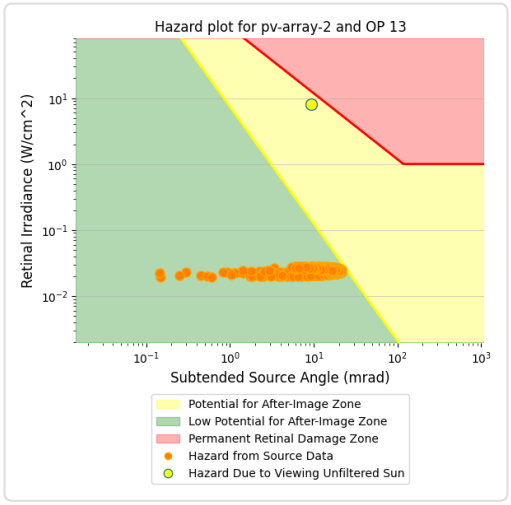
PV array 2 and OP 13

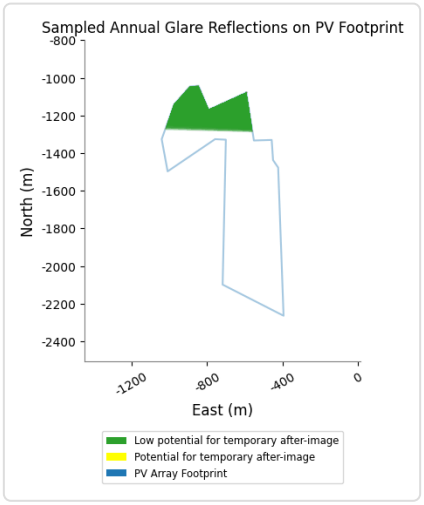
Yellow glare: none

Green glare: 553 min.



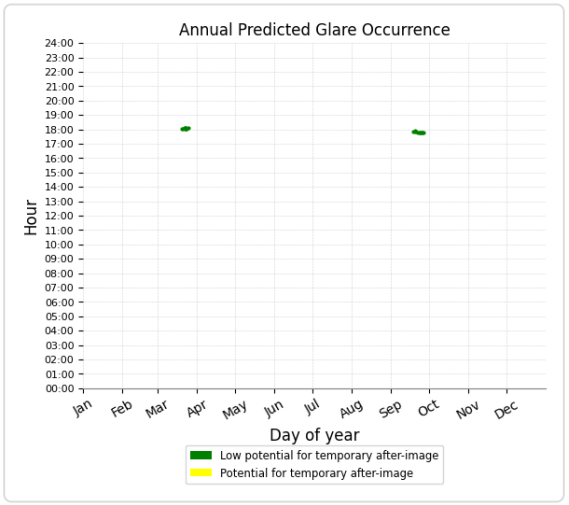


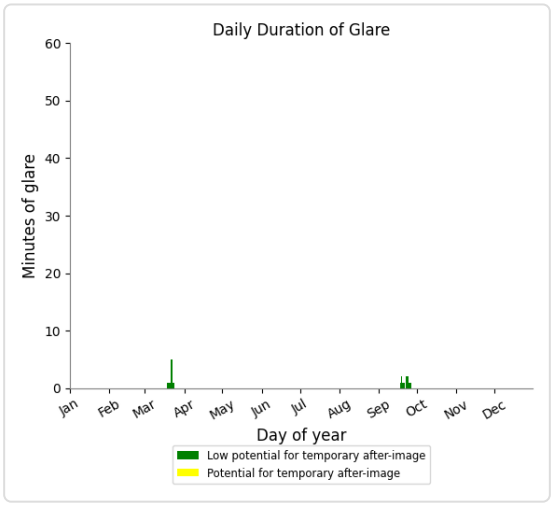


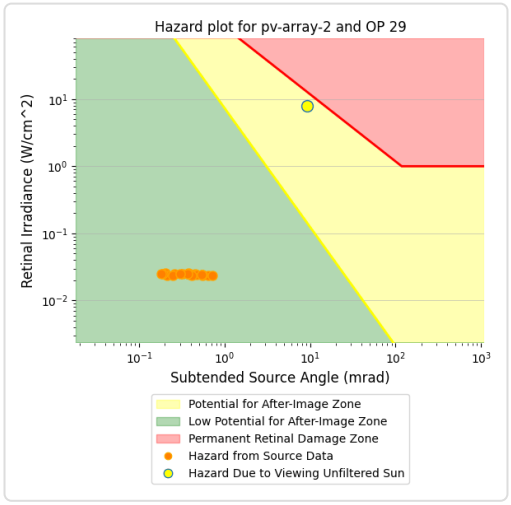


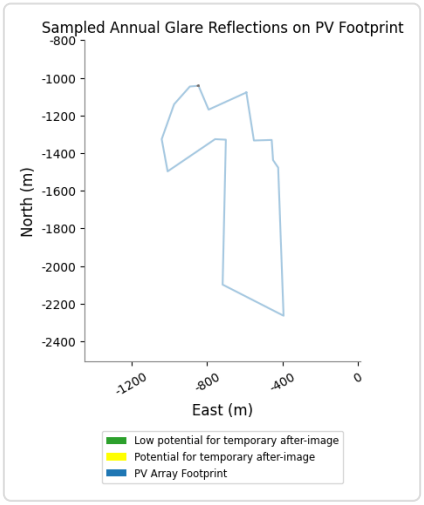
PV array 2 and OP 29

Yellow glare: none
Green glare: 21 min.









PV array 2 and OP 1

No glare found

PV array 2 and OP 3

No glare found

PV array 2 and OP 4

No glare found

PV array 2 and OP 5

No glare found

PV array 2 and OP 6

No glare found

PV array 2 and OP 11

No glare found

PV array 2 and OP 12

No glare found

PV array 2 and OP 17

No glare found

PV array 2 and OP 18

No glare found

PV array 2 and OP 20

No glare found

PV array 2 and OP 27

No glare found

PV array 2 and OP 28

No glare found

PV: PV array 3 potential temporary after-image

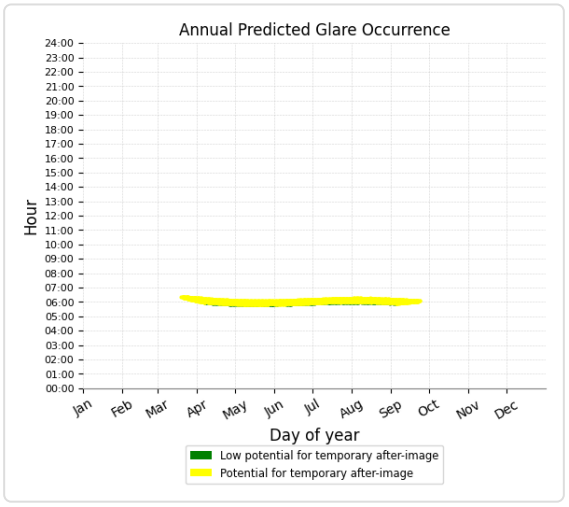
Receptor results ordered by category of glare

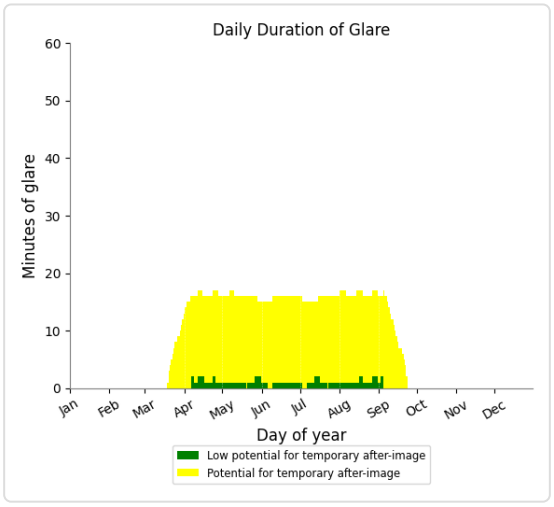
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1	169	2.8	2,621	43.7
Route 4	14	0.2	97	1.6
Route 3	3,945	65.8	4,892	81.5
Route 2	269	4.5	993	16.6
OP 7	1,105	18.4	3,399	56.6
OP 8	730	12.2	2,833	47.2
OP 9	1,011	16.9	3,458	57.6
OP 10	1,038	17.3	3,715	61.9
OP 13	1,083	18.1	661	11.0
OP 14	625	10.4	125	2.1
OP 15	685	11.4	190	3.2
OP 16	1,034	17.2	969	16.1
OP 17	537	8.9	339	5.7
OP 19	530	8.8	2,126	35.4
OP 21	967	16.1	2,888	48.1
OP 22	314	5.2	2,230	37.2
OP 23	540	9.0	3,225	53.8
OP 24	711	11.8	2,775	46.2
OP 25	880	14.7	3,083	51.4
OP 26	808	13.5	317	5.3
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

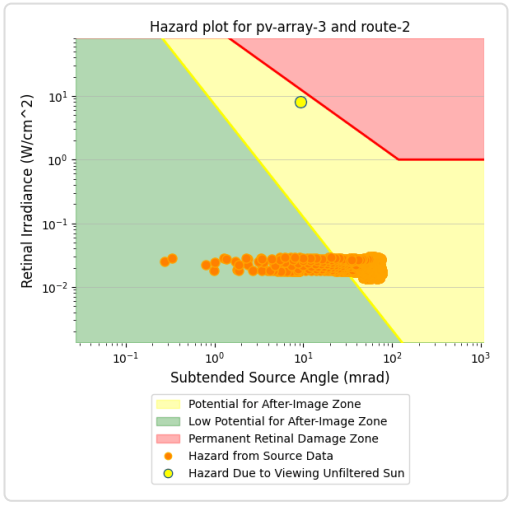
PV array 3 and Route: Route 1

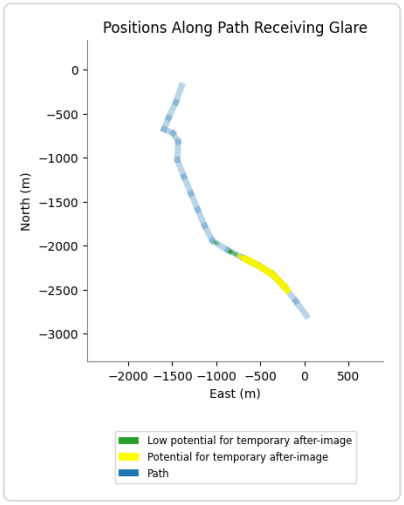
Yellow glare: 2,621 min.

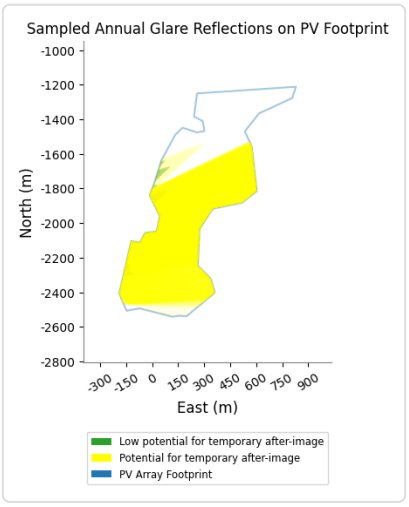
Green glare: 169 min.







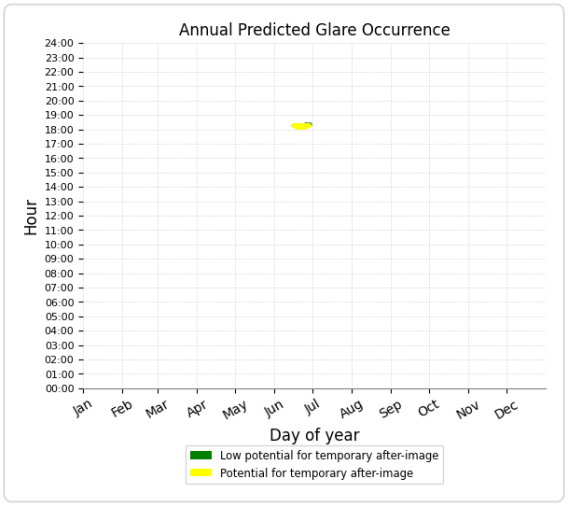


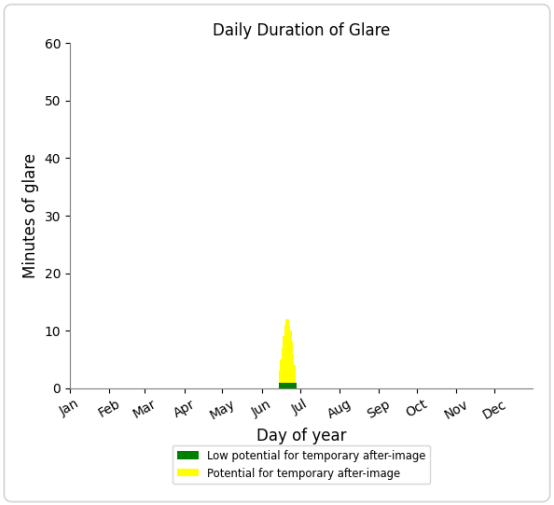


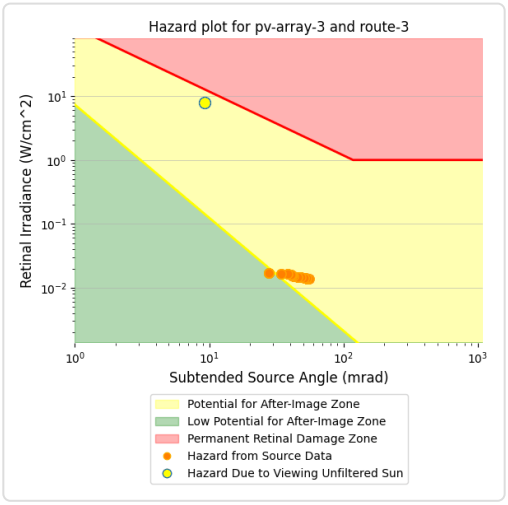
PV array 3 and Route: Route 4

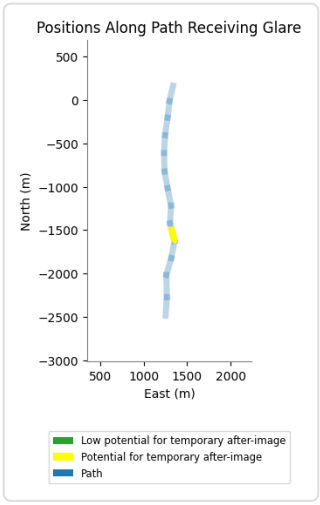
Yellow glare: 97 min.

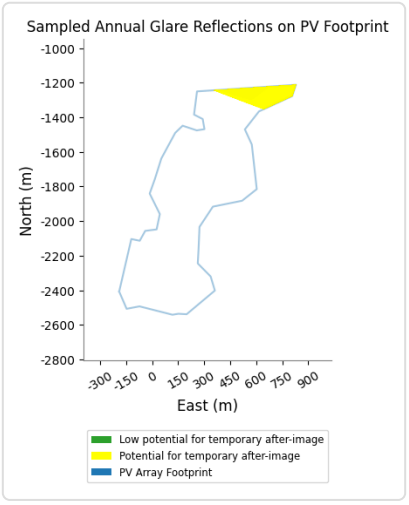
Green glare: 14 min.







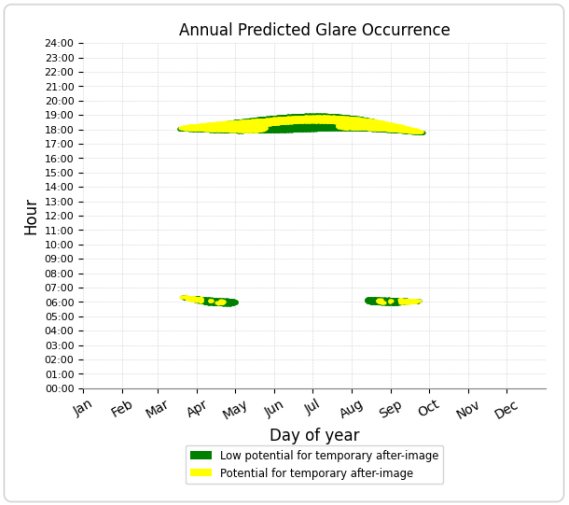


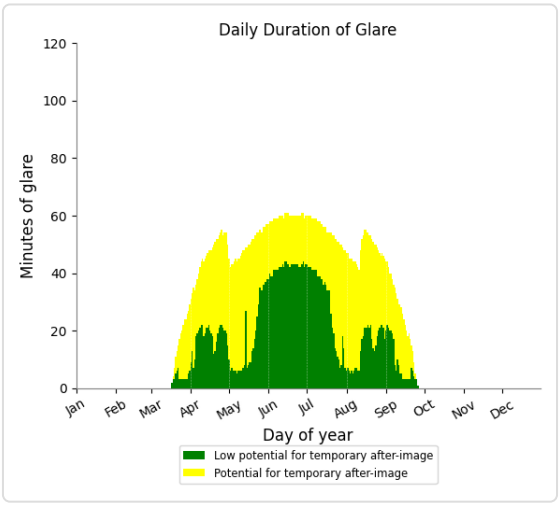


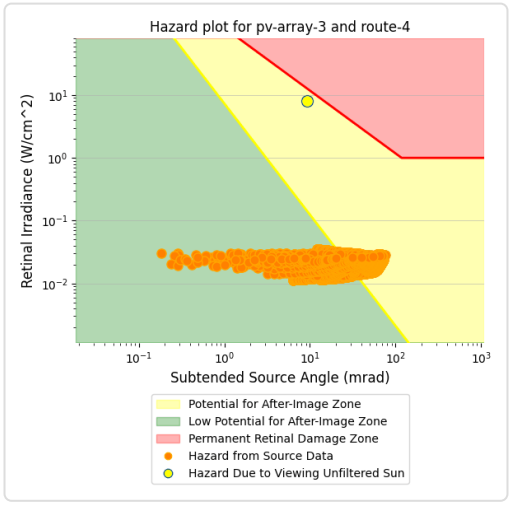
PV array 3 and Route: Route 3

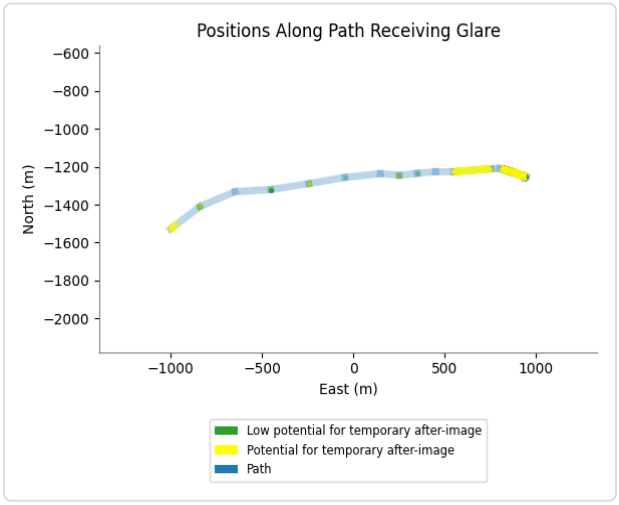
Yellow glare: 4,892 min.

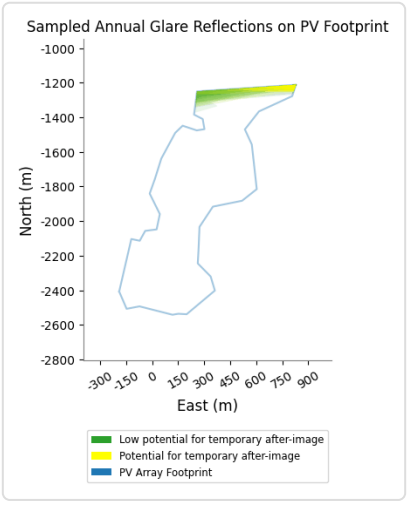
Green glare: 3,945 min.







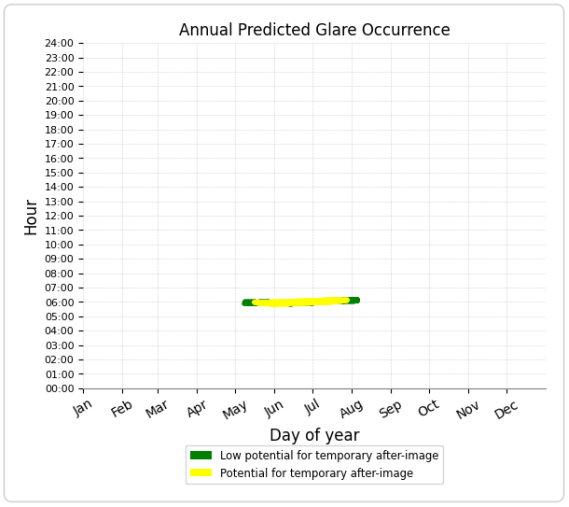


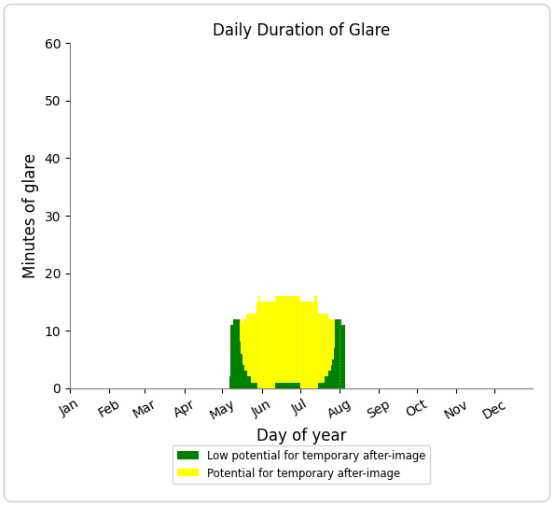


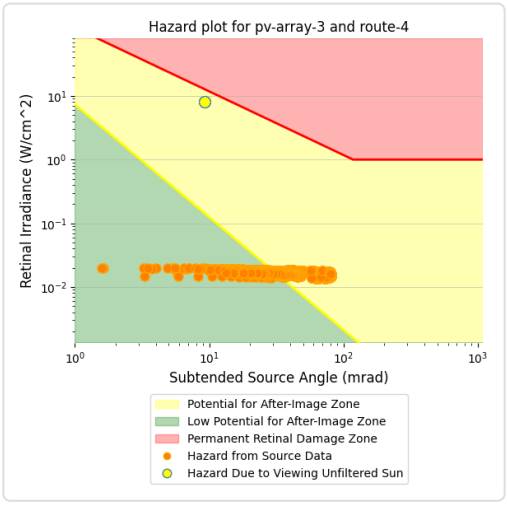
PV array 3 and Route: Route 2

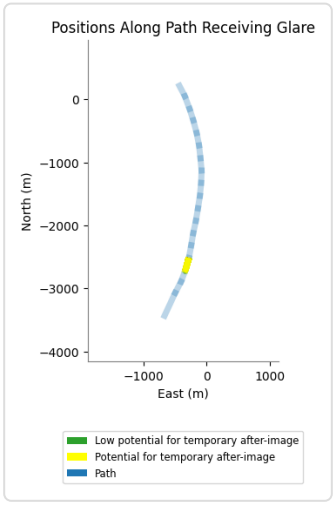
Yellow glare: 993 min.

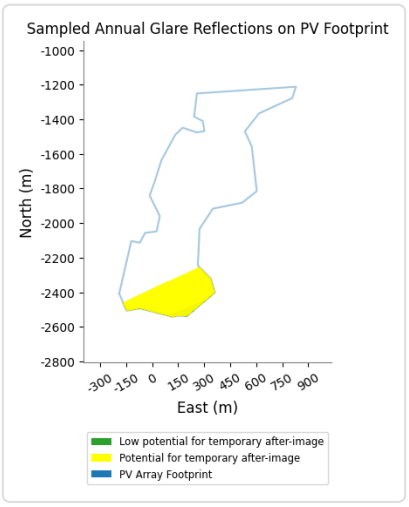
Green glare: 269 min.







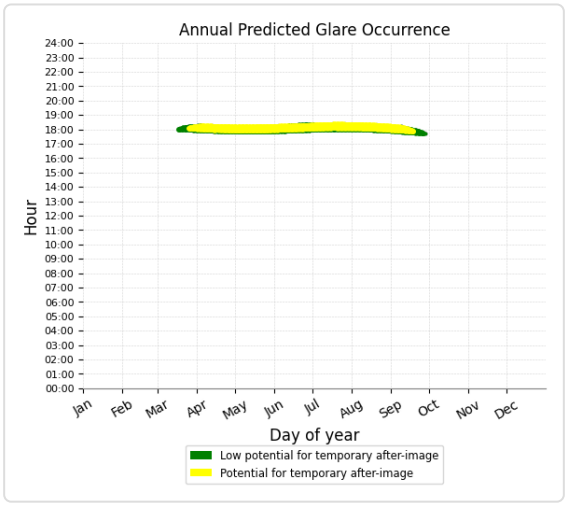


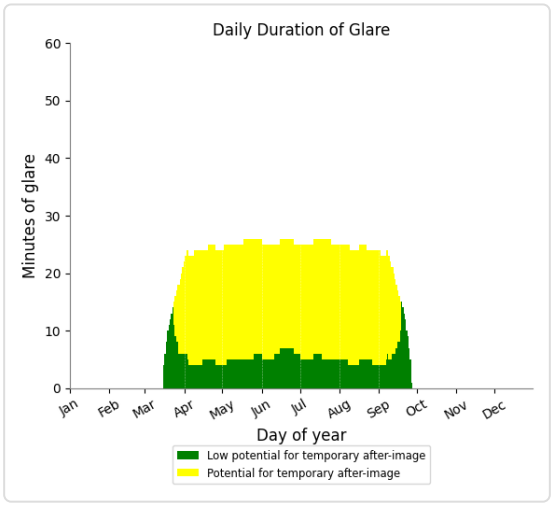


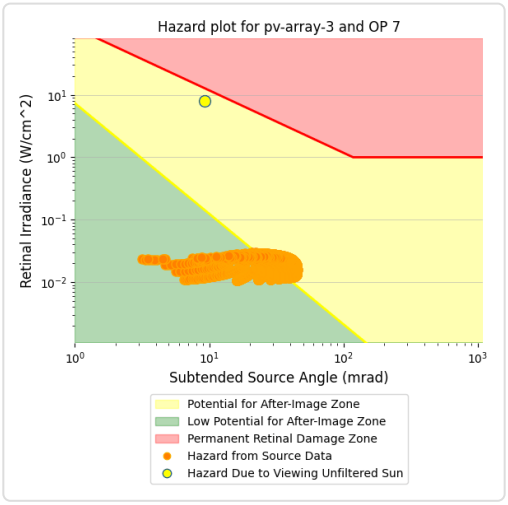
PV array 3 and OP 7

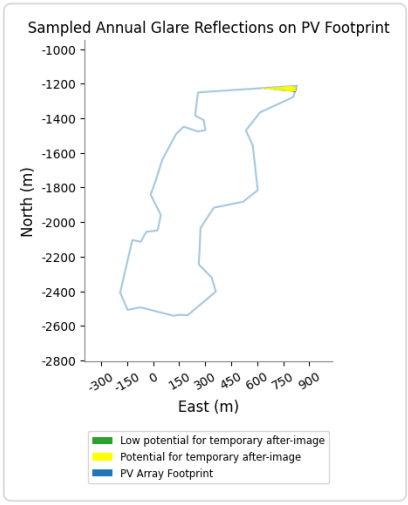
Yellow glare: 3,399 min.

Green glare: 1,105 min.





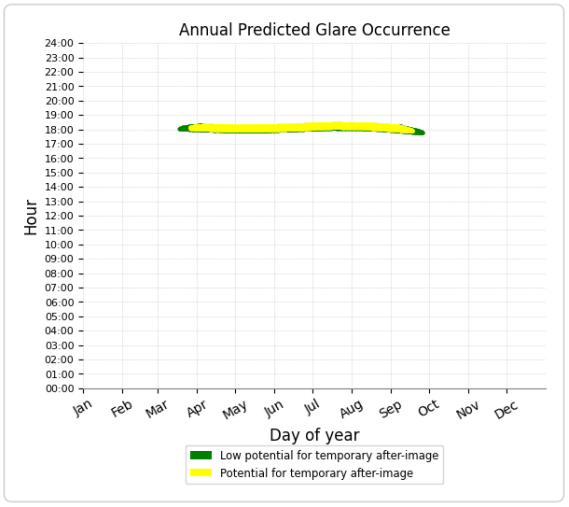


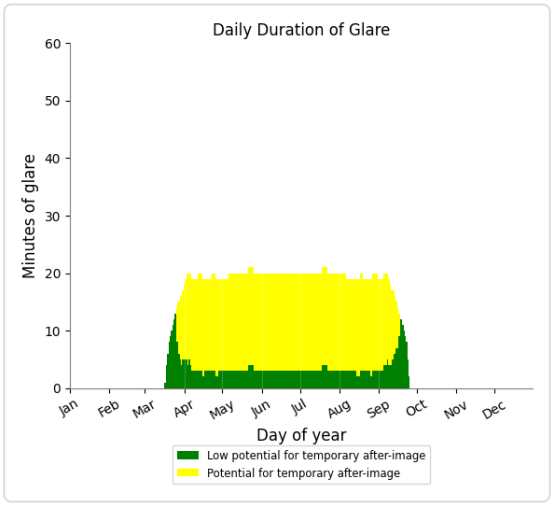


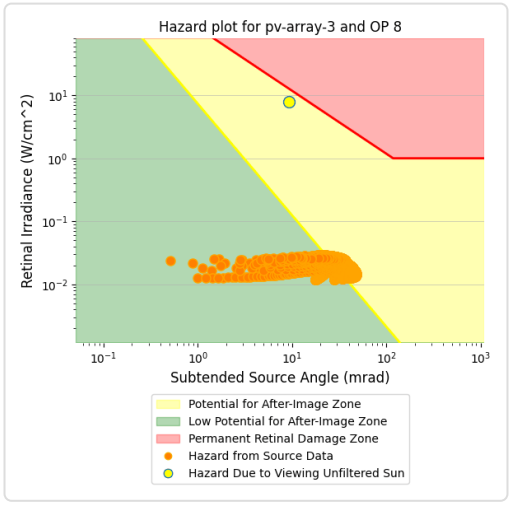
PV array 3 and OP 8

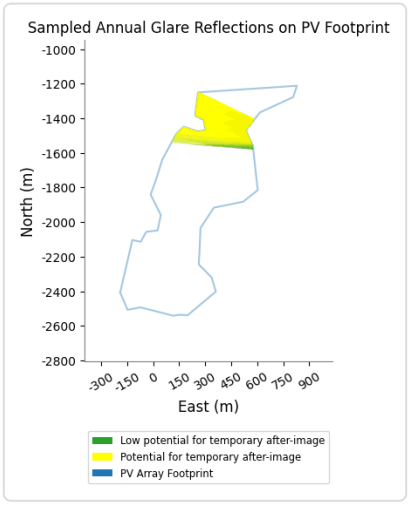
Yellow glare: 2,833 min.

Green glare: 730 min.





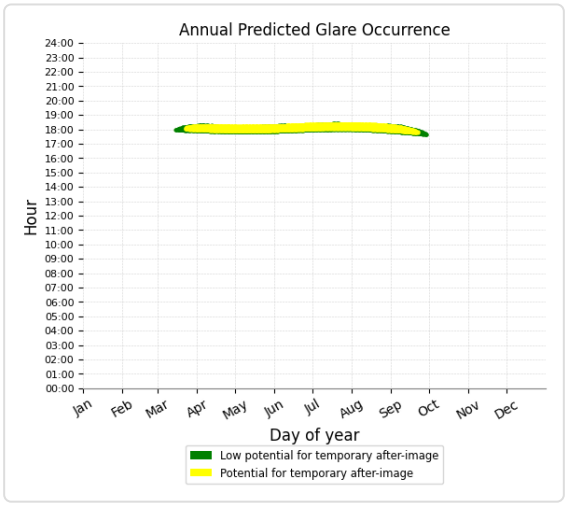


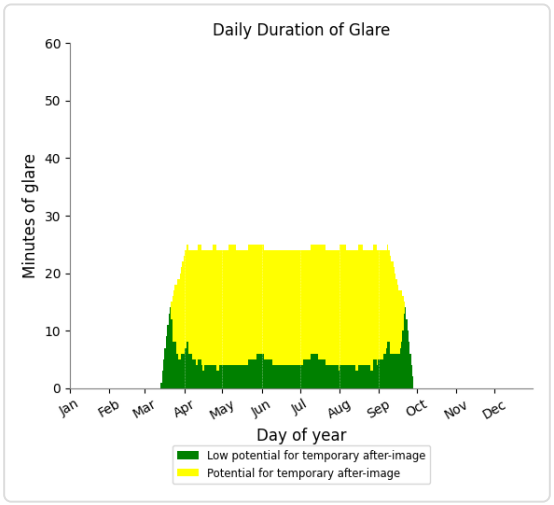


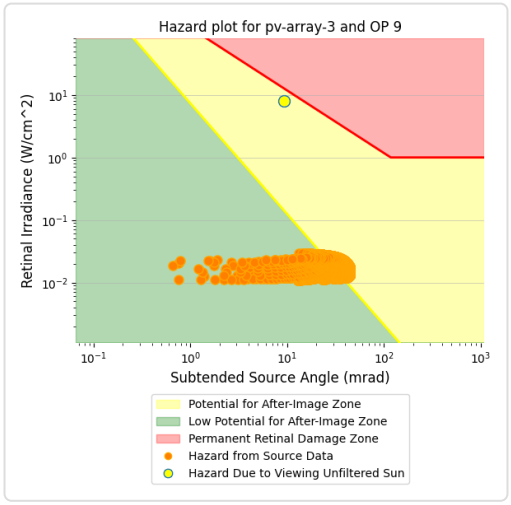
PV array 3 and OP 9

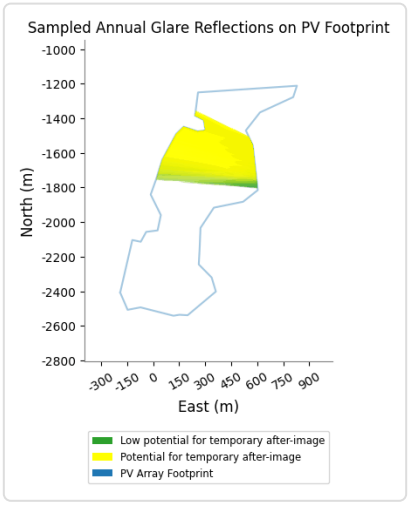
Yellow glare: 3,458 min.

Green glare: 1,011 min.





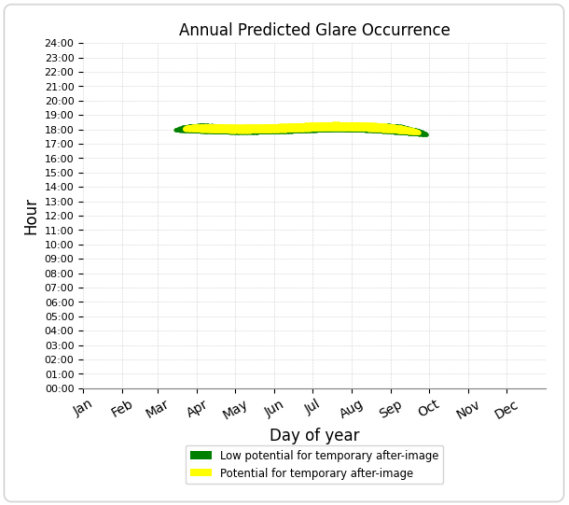


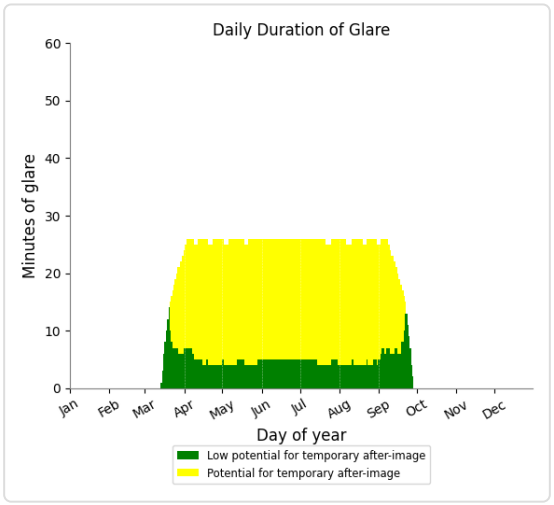


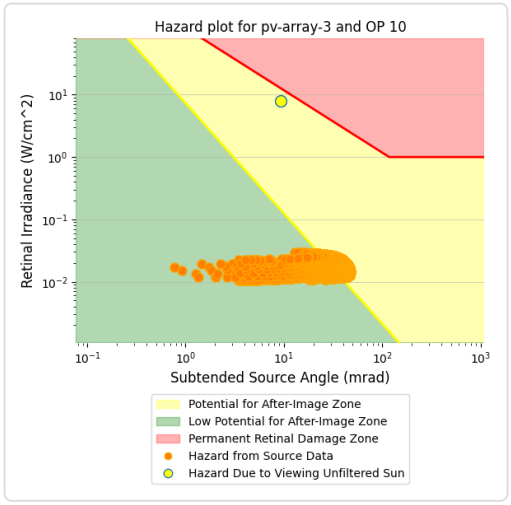
PV array 3 and OP 10

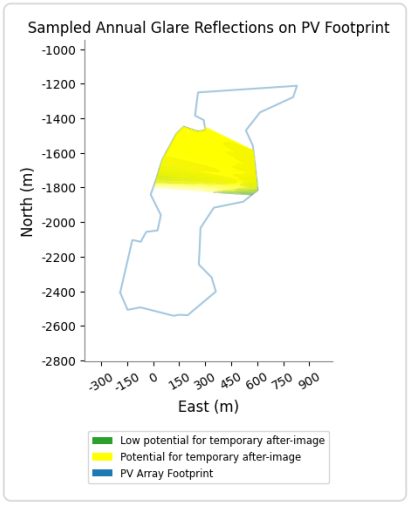
Yellow glare: 3,715 min.

Green glare: 1,038 min.





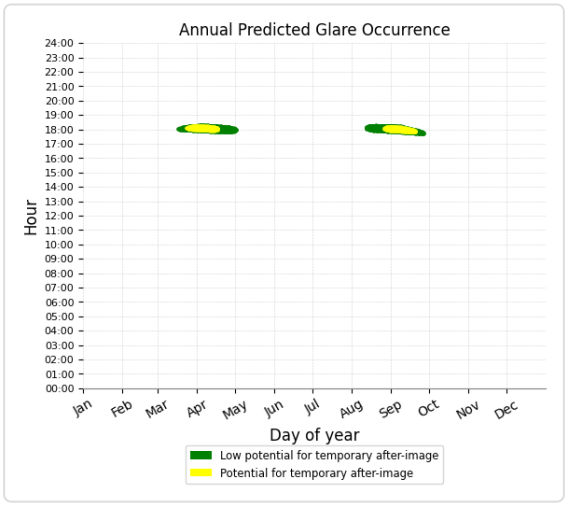


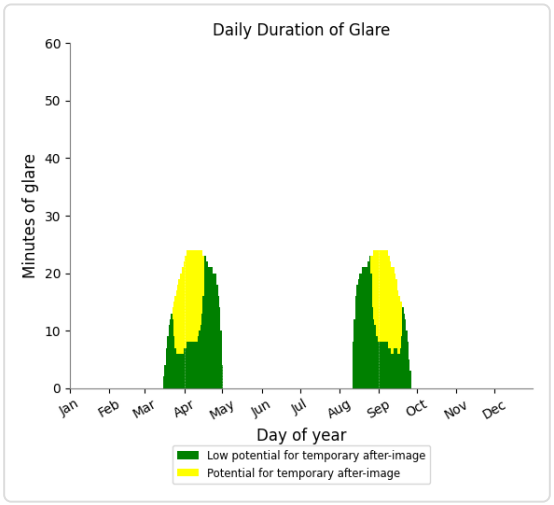


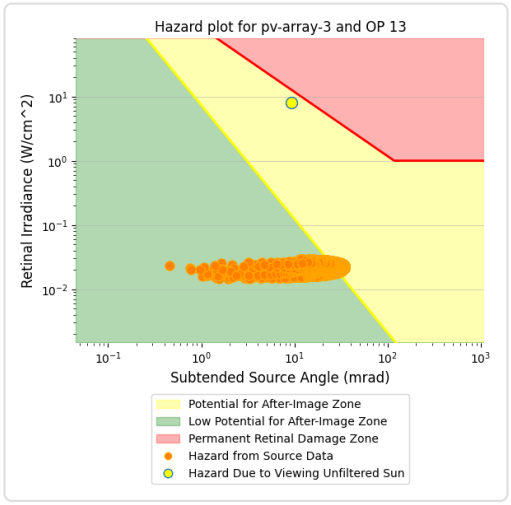
PV array 3 and OP 13

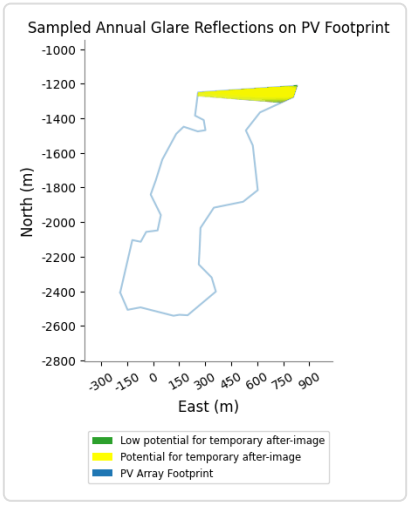
Yellow glare: 661 min.

Green glare: 1,083 min.





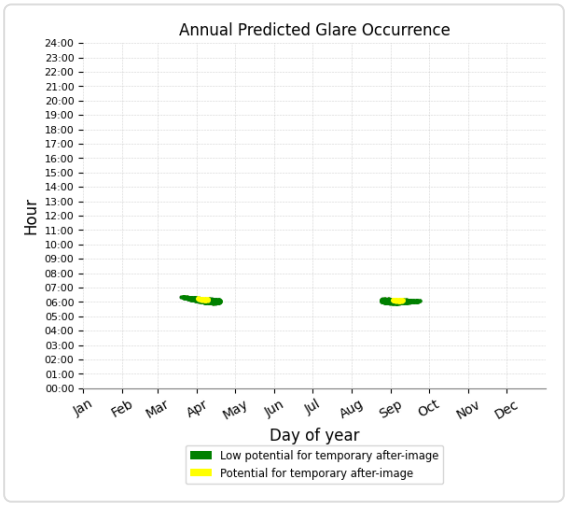


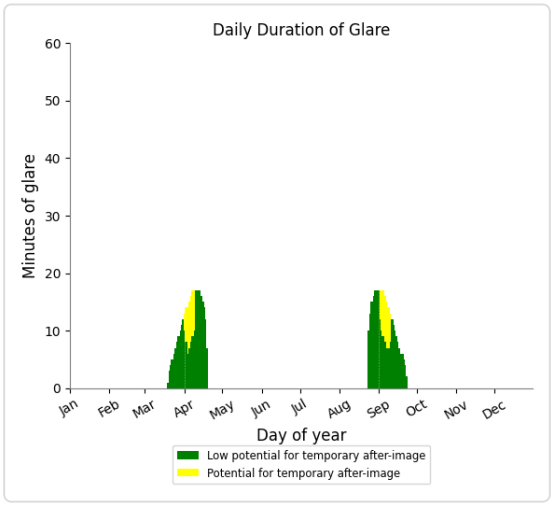


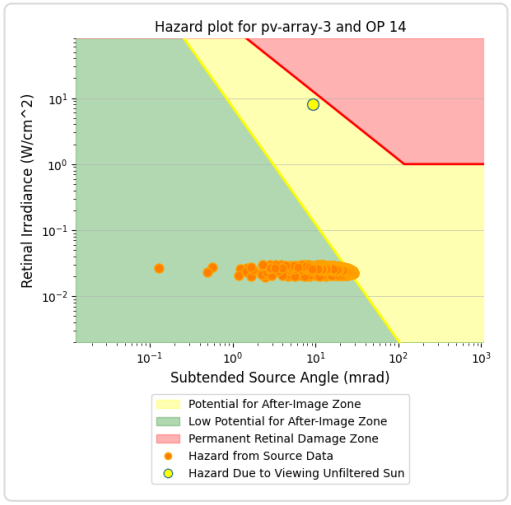
PV array 3 and OP 14

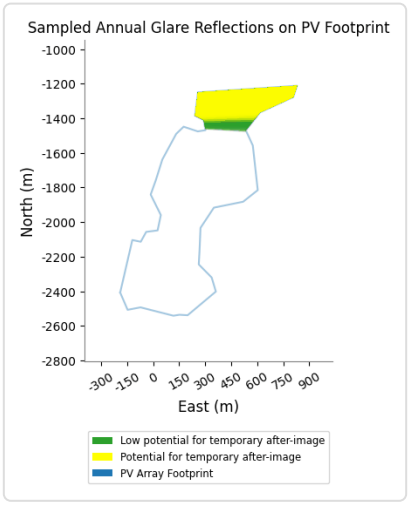
Yellow glare: 125 min.

Green glare: 625 min.





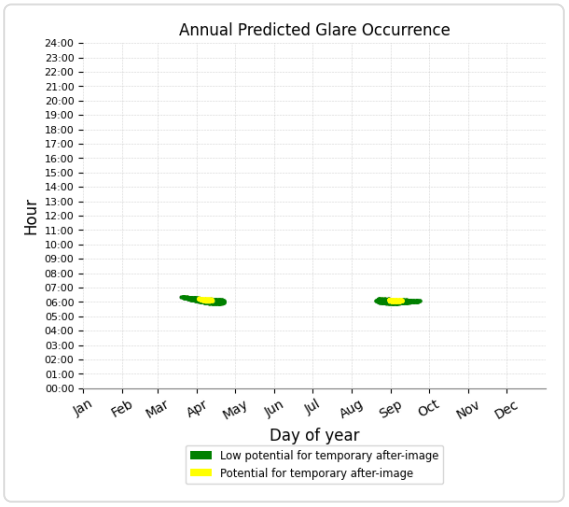


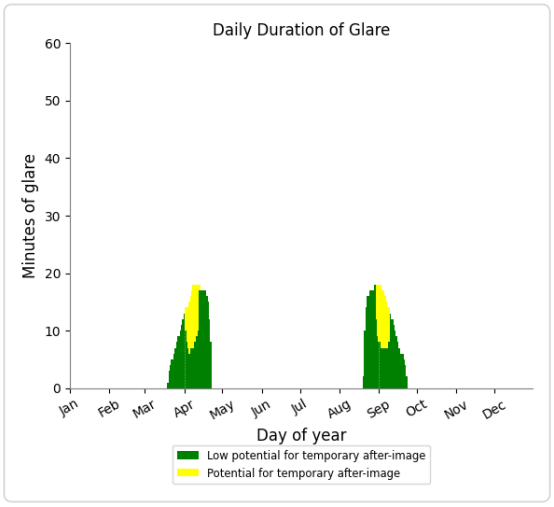


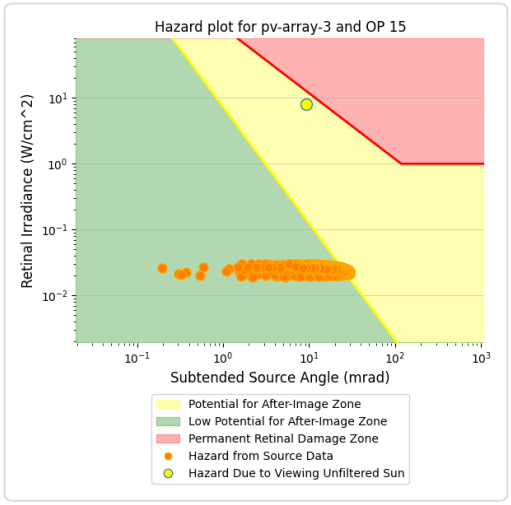
PV array 3 and OP 15

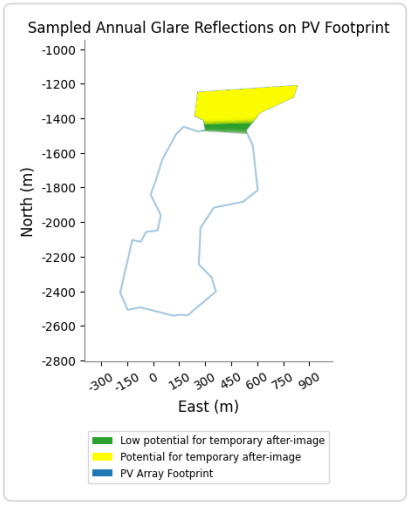
Yellow glare: 190 min.

Green glare: 685 min.





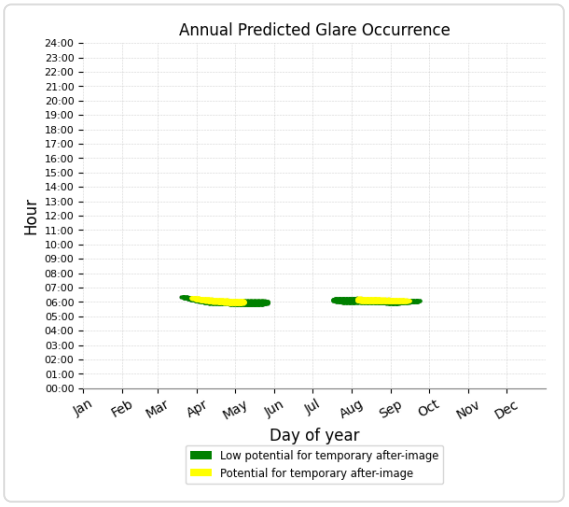


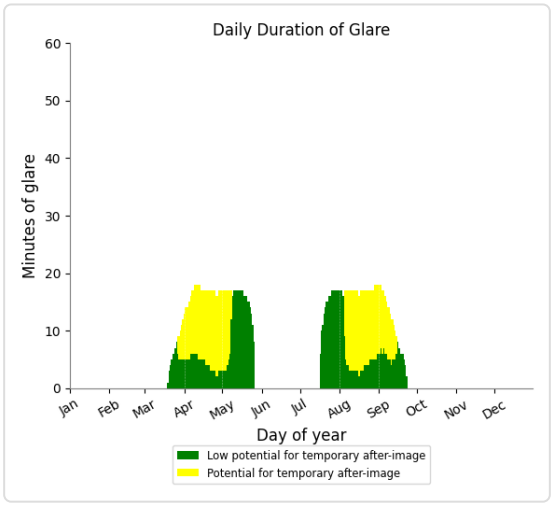


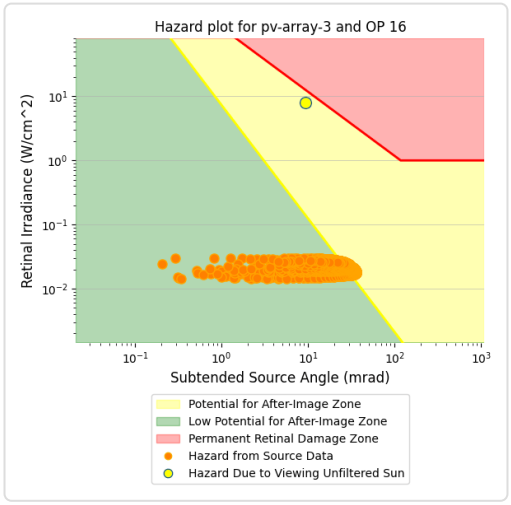
PV array 3 and OP 16

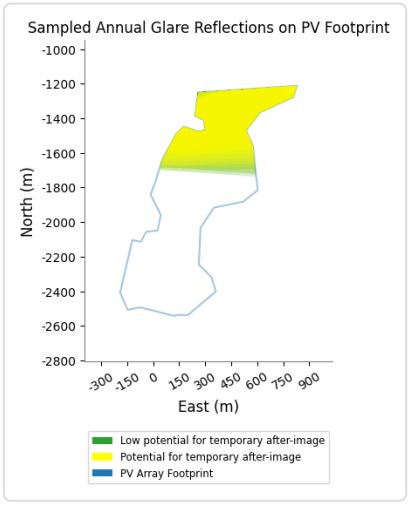
Yellow glare: 969 min.

Green glare: 1,034 min.





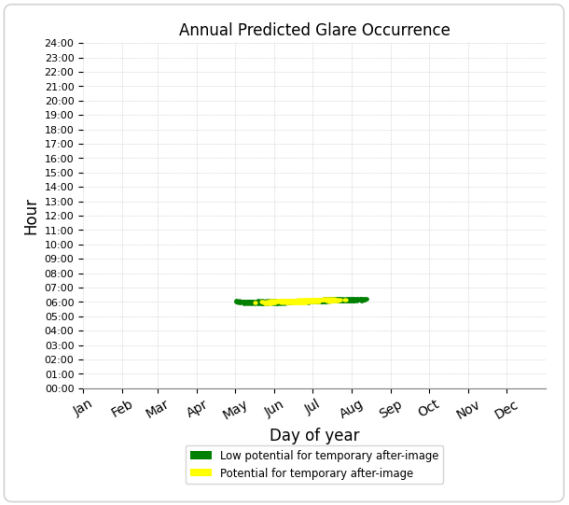


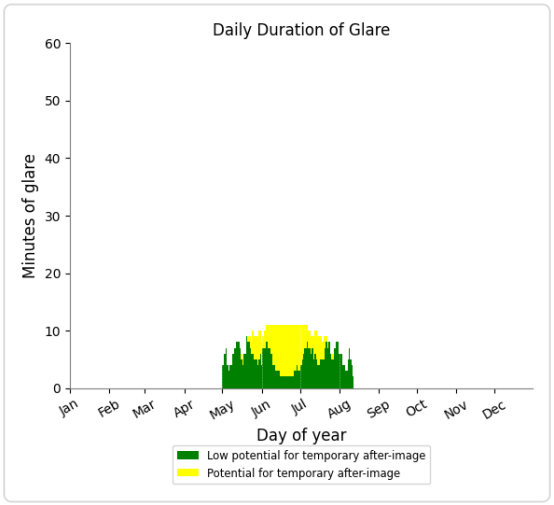


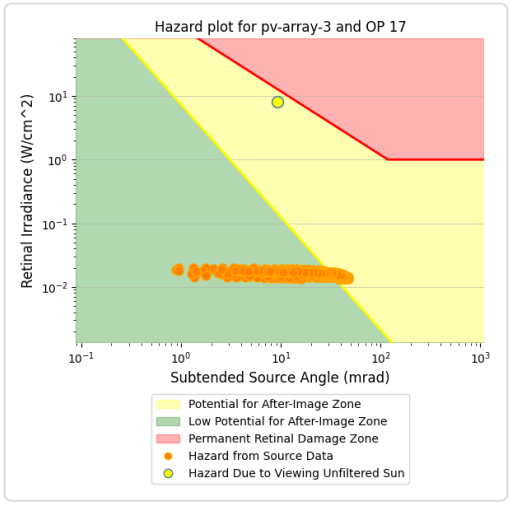
PV array 3 and OP 17

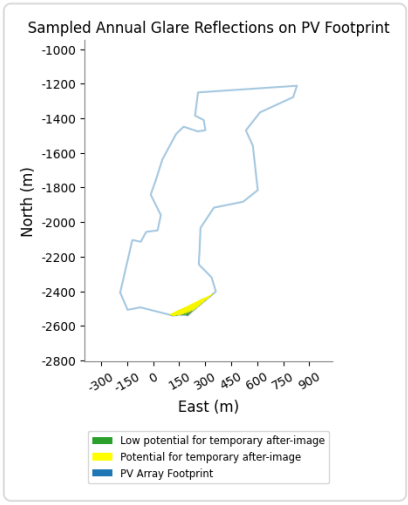
Yellow glare: 339 min.

Green glare: 537 min.





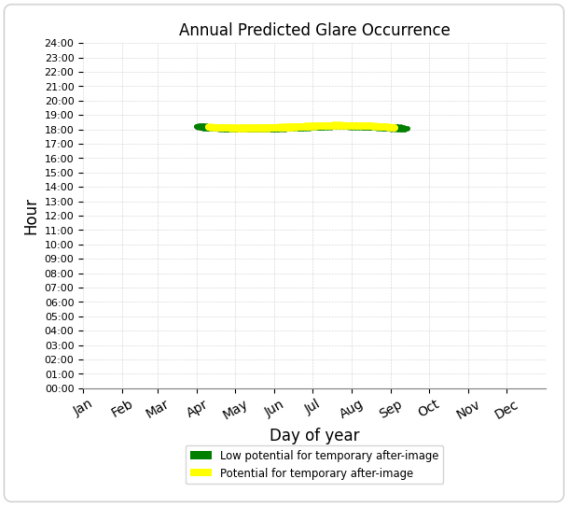


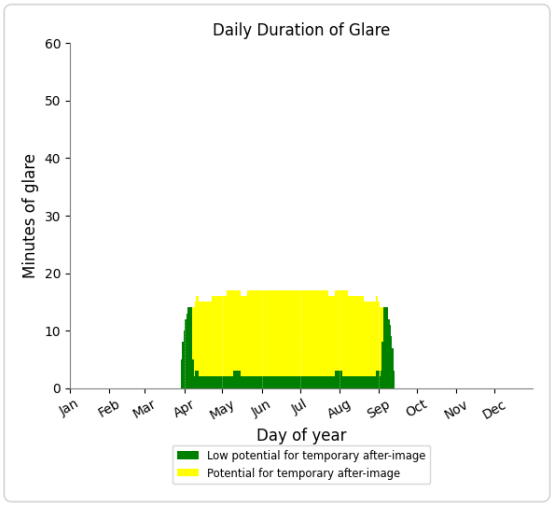


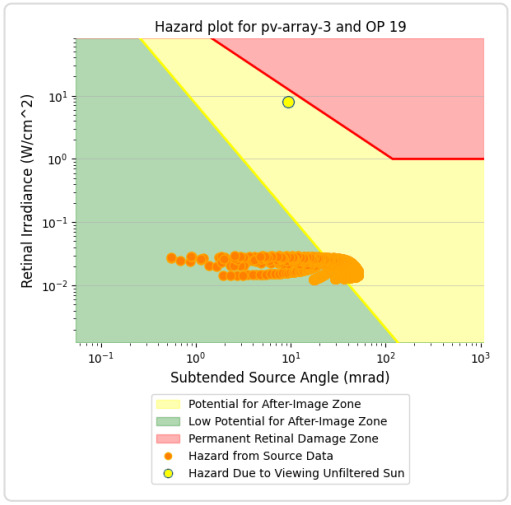
PV array 3 and OP 19

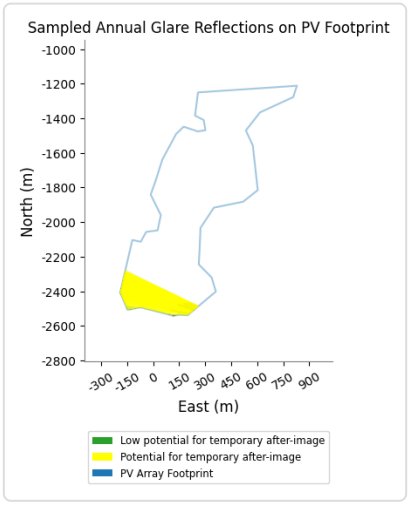
Yellow glare: 2,126 min.

Green glare: 530 min.





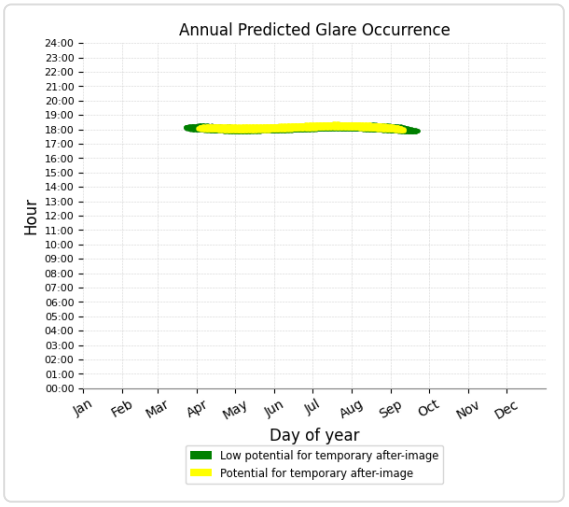


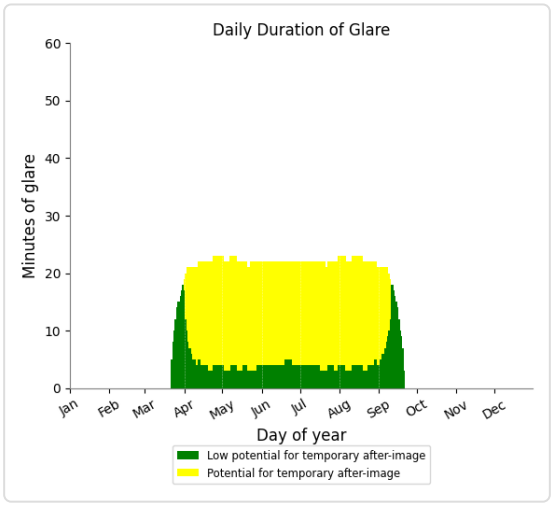


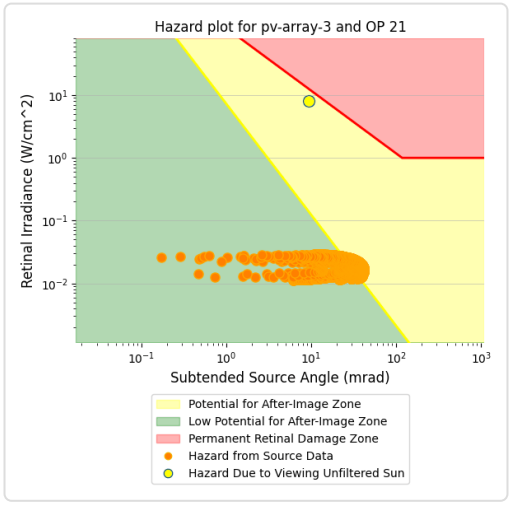
PV array 3 and OP 21

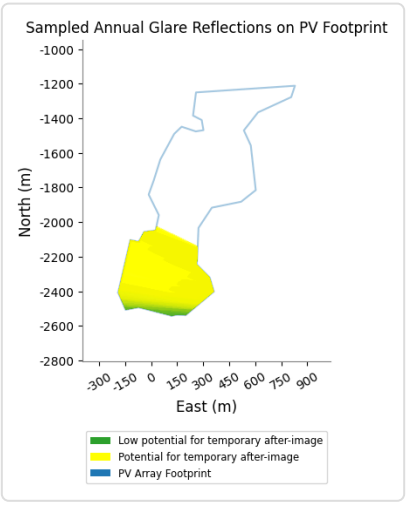
Yellow glare: 2,888 min.

Green glare: 967 min.





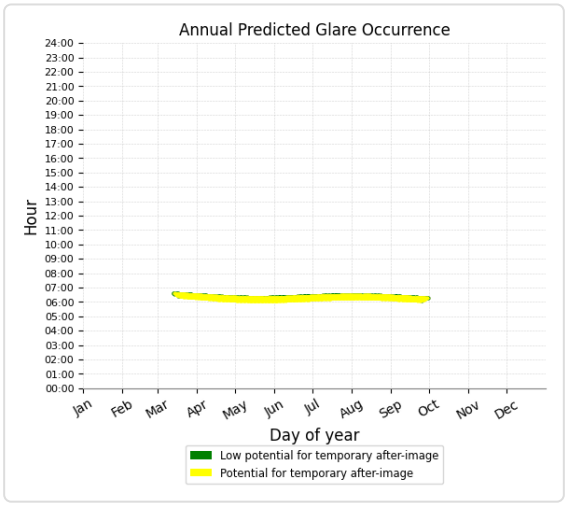


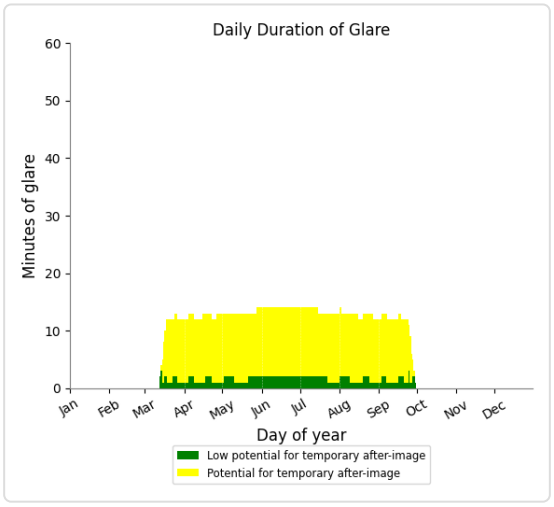


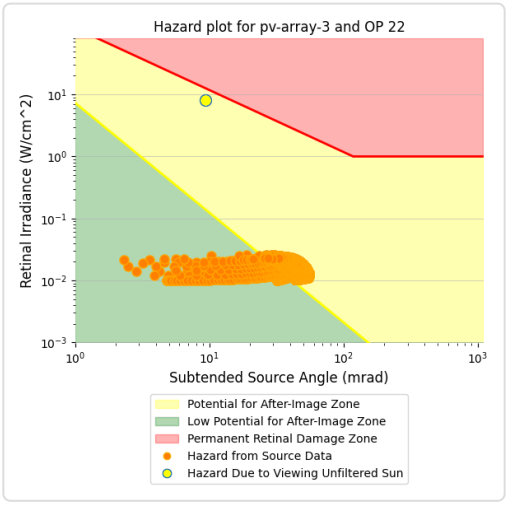
PV array 3 and OP 22

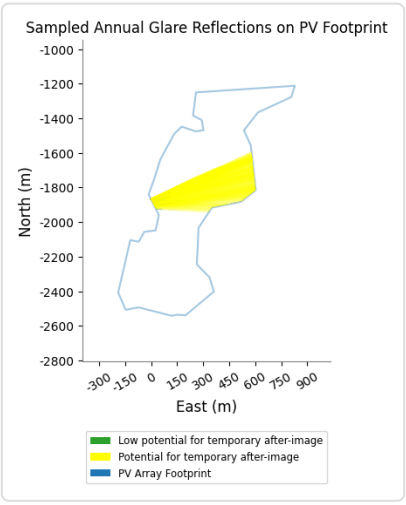
Yellow glare: 2,230 min.

Green glare: 314 min.





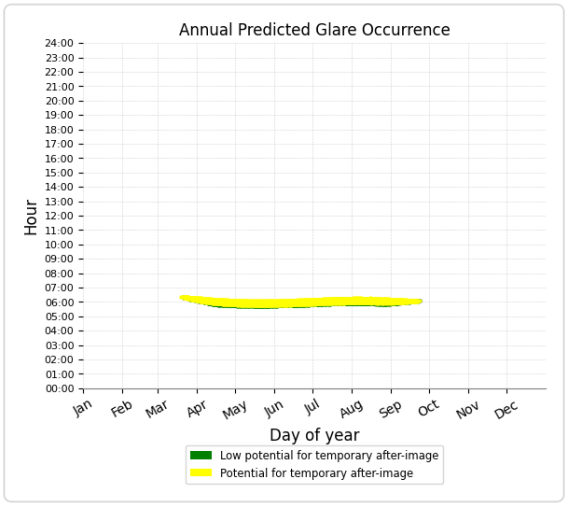


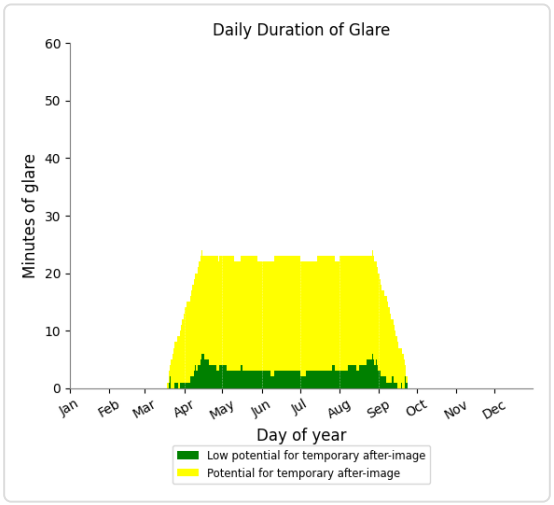


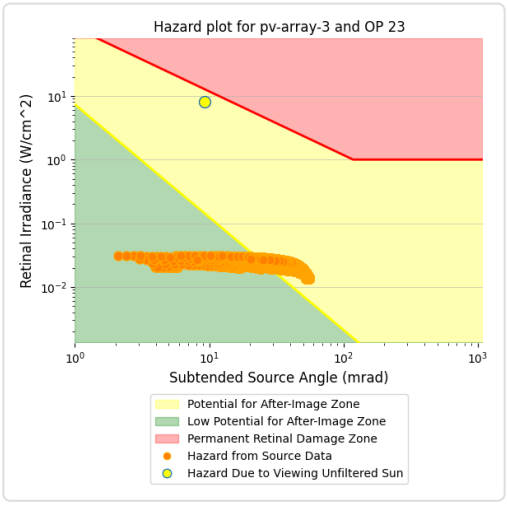
PV array 3 and OP 23

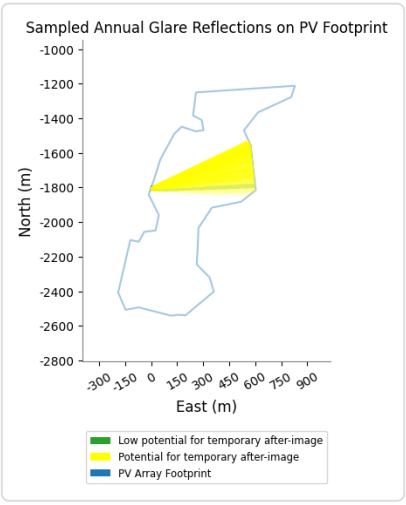
Yellow glare: 3,225 min.

Green glare: 540 min.





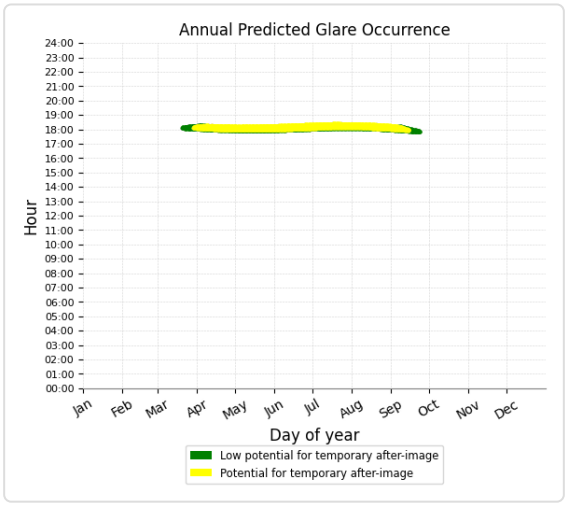


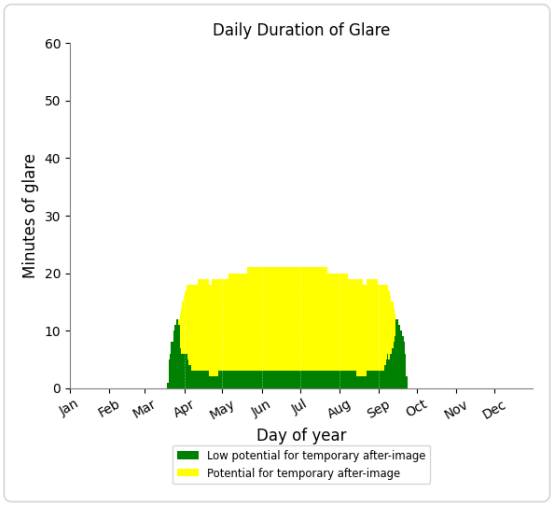


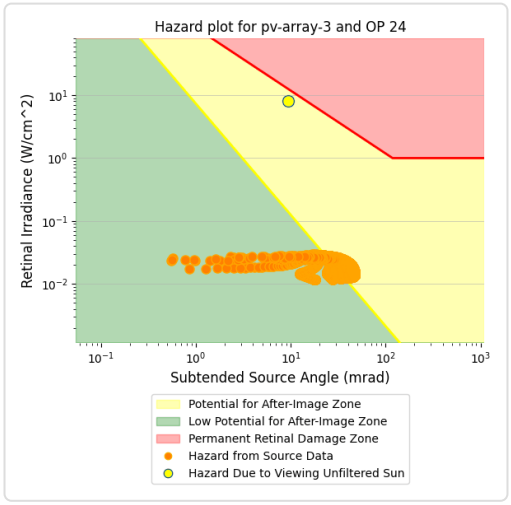
PV array 3 and OP 24

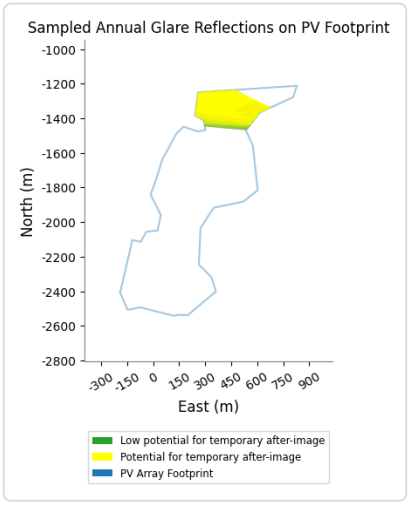
Yellow glare: 2,775 min.

Green glare: 711 min.





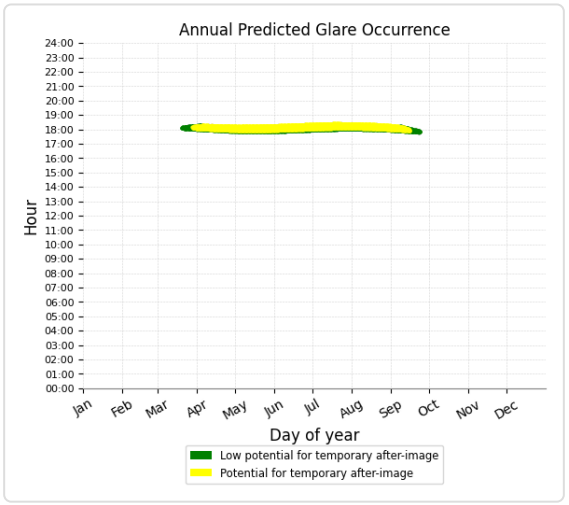


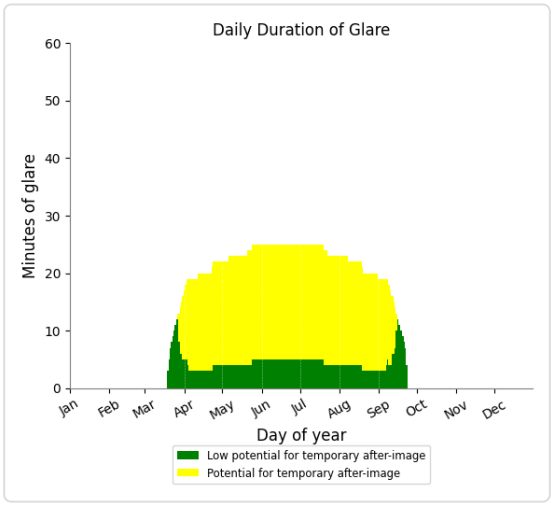


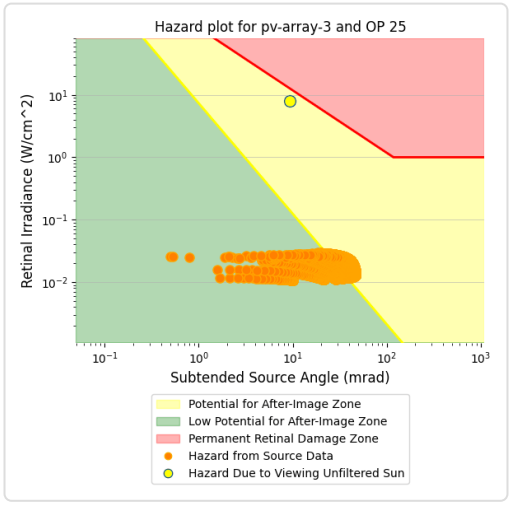
PV array 3 and OP 25

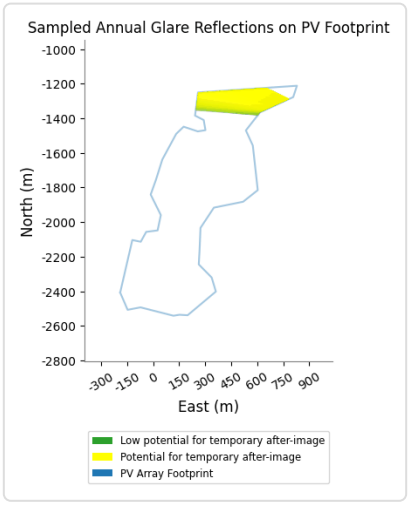
Yellow glare: 3,083 min.

Green glare: 880 min.





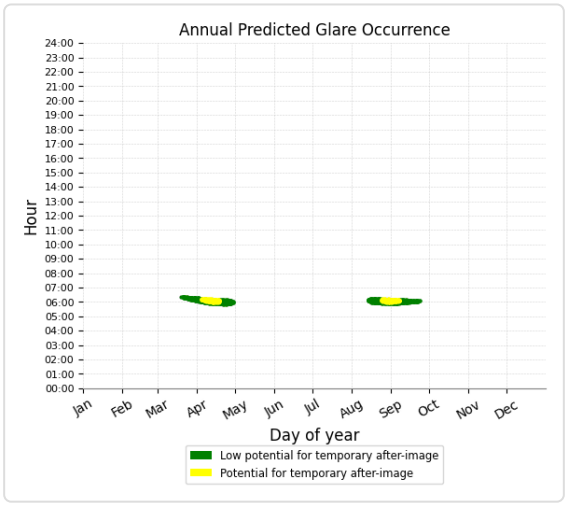


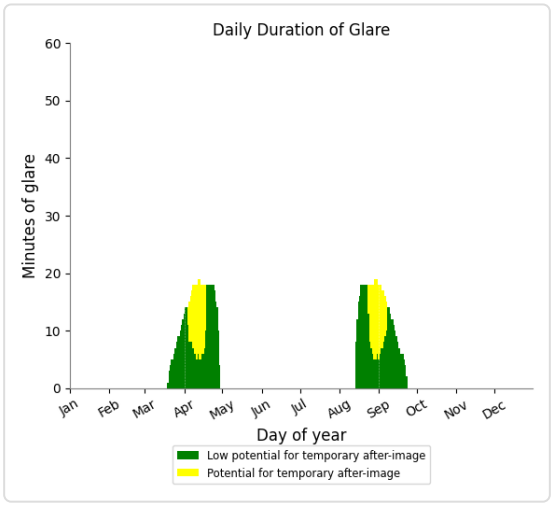


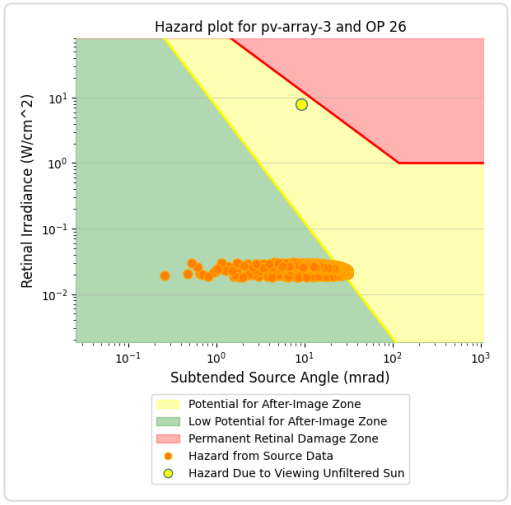
PV array 3 and OP 26

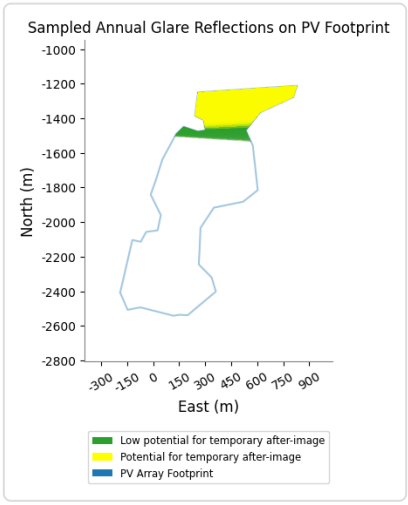
Yellow glare: 317 min.

Green glare: 808 min.









PV array 3 and OP 1

No glare found

PV array 3 and OP 2

No glare found

PV array 3 and OP 3

No glare found

PV array 3 and OP 4

No glare found

PV array 3 and OP 5

No glare found

PV array 3 and OP 6

No glare found

PV array 3 and OP 11

No glare found

PV array 3 and OP 12

No glare found

PV array 3 and OP 18

No glare found

PV array 3 and OP 20

No glare found

PV array 3 and OP 27

No glare found

PV array 3 and OP 28

No glare found

PV array 3 and OP 29

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

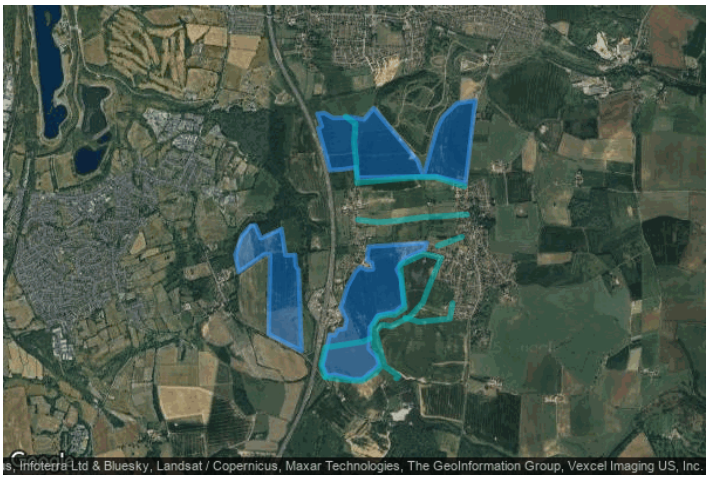
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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 3**
Site configuration: **JS W3 - PRoWs-temp-12**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153799.25517

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	8.0	180.0	72,807	1,213.5	76,116	1,268.6	-
PV array 14	8.0	180.0	5,007	83.5	6,624	110.4	-
PV array 3	8.0	180.0	101,980	1,699.7	126,073	2,101.2	-

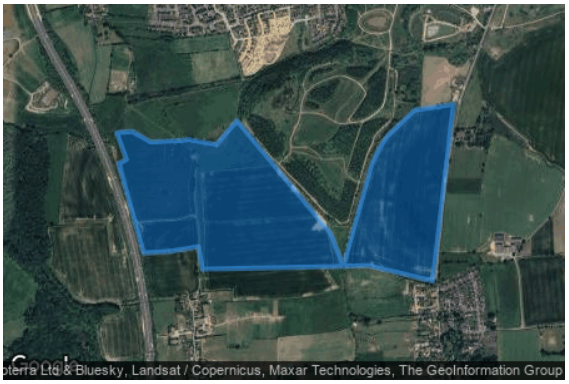
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	89,796	1,496.6	92,270	1,537.8
PRoW 10	69,986	1,166.4	72,525	1,208.8
PRoW 11	3,543	59.0	6,335	105.6
PRoW 2	11,370	189.5	32,591	543.2
PRoW 4	2,760	46.0	1,678	28.0
PRoW 5	2,339	39.0	3,414	56.9

Component Data

PV Arrays

Name: PV array 10
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332187	-1.278957	90.29	3.80	94.09
2	53.332123	-1.281038	93.39	3.80	97.19
3	53.332559	-1.282304	96.34	3.80	100.14
4	53.332507	-1.283377	99.28	3.80	103.08
5	53.331405	-1.282712	97.51	3.80	101.31
6	53.331252	-1.283248	100.06	3.80	103.86
7	53.327587	-1.281531	105.78	3.80	109.58
8	53.327651	-1.279665	115.20	3.80	119.00
9	53.327843	-1.277755	105.29	3.80	109.09
10	53.326920	-1.277497	106.91	3.80	110.71
11	53.327036	-1.267863	90.02	3.80	93.82
12	53.327074	-1.266125	91.84	3.80	95.64
13	53.326433	-1.261662	99.50	3.80	103.30
14	53.333661	-1.260224	89.56	3.80	93.36
15	53.333430	-1.262885	88.21	3.80	92.01
16	53.332367	-1.264794	90.44	3.80	94.24
17	53.331828	-1.265352	89.00	3.80	92.80
18	53.331226	-1.265846	88.66	3.80	92.46
19	53.327060	-1.267801	90.20	3.80	94.00
20	53.328381	-1.268657	89.34	3.80	93.14
21	53.332994	-1.275116	89.05	3.80	92.85
22	53.332021	-1.276532	88.05	3.80	91.85
23	53.332226	-1.278399	90.83	3.80	94.63

Name: PV array 14
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.322460	-1.288645	97.50	3.80	101.30
2	53.321639	-1.291649	102.80	3.80	106.60
3	53.322780	-1.292454	93.40	3.80	97.20
4	53.322745	-1.293141	93.60	3.80	97.40
5	53.321896	-1.294396	96.50	3.80	100.30
6	53.320230	-1.295383	104.90	3.80	108.70
7	53.318691	-1.294911	109.70	3.80	113.50
8	53.320230	-1.291134	114.20	3.80	118.00
9	53.320204	-1.290276	114.80	3.80	118.60
10	53.313282	-1.290534	137.70	3.80	141.50
11	53.311795	-1.285684	130.10	3.80	133.90
12	53.318871	-1.286113	103.90	3.80	107.70
13	53.319230	-1.286521	102.90	3.80	106.70
14	53.320191	-1.286628	99.20	3.80	103.00
15	53.320165	-1.288044	105.20	3.80	109.00

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.310510	-1.282613	128.50	3.80	132.30
2	53.309613	-1.281969	123.20	3.80	127.00
3	53.309741	-1.280853	123.40	3.80	127.20
4	53.309305	-1.277999	116.70	3.80	120.50
5	53.309357	-1.277484	116.30	3.80	120.10
6	53.309331	-1.276776	113.30	3.80	117.10
7	53.310562	-1.274330	105.20	3.80	109.00
8	53.311292	-1.274695	105.50	3.80	109.30
9	53.311972	-1.275810	107.30	3.80	111.10
10	53.312651	-1.275746	105.90	3.80	109.70
11	53.313869	-1.275660	104.40	3.80	108.20
12	53.314920	-1.274502	103.80	3.80	107.60
13	53.315228	-1.271970	105.20	3.80	109.00
14	53.315831	-1.270704	104.50	3.80	108.30
15	53.318151	-1.271133	104.70	3.80	108.50
16	53.318933	-1.271733	104.80	3.80	108.60
17	53.319868	-1.270510	101.50	3.80	105.30
18	53.320663	-1.267635	95.70	3.80	99.50
19	53.321253	-1.267313	95.10	3.80	98.90
20	53.320907	-1.275875	110.60	3.80	114.40
21	53.319702	-1.276132	113.30	3.80	117.10
22	53.319471	-1.275381	114.10	3.80	117.90
23	53.318945	-1.275231	116.50	3.80	120.30
24	53.318881	-1.275896	119.00	3.80	122.80
25	53.319125	-1.277119	114.60	3.80	118.40
26	53.318753	-1.277763	113.90	3.80	117.70
27	53.317420	-1.278965	117.70	3.80	121.50
28	53.316356	-1.279523	117.50	3.80	121.30
29	53.315600	-1.279973	121.80	3.80	125.60
30	53.314536	-1.279093	119.30	3.80	123.10
31	53.313738	-1.279373	121.00	3.80	124.80
32	53.313662	-1.280360	125.70	3.80	129.50
33	53.313149	-1.280833	128.20	3.80	132.00
34	53.313238	-1.281562	128.30	3.80	132.10

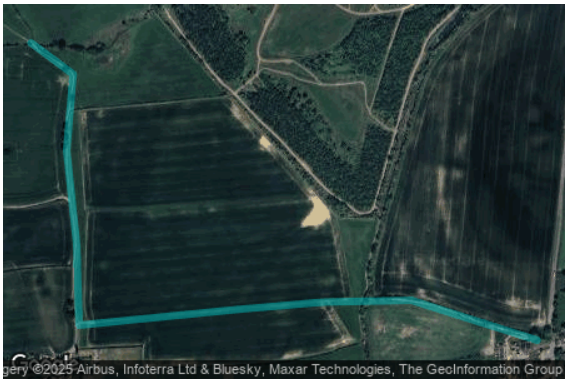
Route Receptors

Name: PRoW 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.309550	-1.282304	124.40	2.50	126.90
2	53.310569	-1.282830	129.95	2.50	132.45
3	53.312101	-1.282229	128.61	2.50	131.11
4	53.312383	-1.279182	125.60	2.50	128.10
5	53.312627	-1.276704	110.95	2.50	113.45
6	53.312877	-1.275684	108.02	2.50	110.52

Name: PRoW 10
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332266	-1.279219	91.06	2.50	93.56
2	53.331625	-1.277776	89.19	2.50	91.69
3	53.330055	-1.277997	93.59	2.50	96.09
4	53.328133	-1.277654	105.11	2.50	107.61
5	53.326479	-1.277570	107.59	2.50	110.09
6	53.326652	-1.274652	96.59	2.50	99.09
7	53.326805	-1.272023	93.67	2.50	96.17
8	53.326953	-1.269137	90.12	2.50	92.62
9	53.326990	-1.266152	92.31	2.50	94.81
10	53.326611	-1.264167	94.24	2.50	96.74
11	53.326169	-1.261828	99.74	2.50	102.24

Name: PRoW 11
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.315971	-1.263552	119.81	2.50	122.31
2	53.314625	-1.263970	124.28	2.50	126.78
3	53.314356	-1.268487	105.01	2.50	107.51
4	53.314695	-1.270494	105.80	2.50	108.30

Name: PRoW 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.309499	-1.282095	124.49	2.50	126.99
2	53.309255	-1.278796	119.41	2.50	121.91
3	53.309183	-1.276969	113.97	2.50	116.47
4	53.309888	-1.274813	107.52	2.50	110.02
5	53.310619	-1.273912	107.01	2.50	109.51
6	53.312209	-1.275028	111.96	2.50	114.46
7	53.313201	-1.275261	110.08	2.50	112.58
8	53.313899	-1.275358	107.07	2.50	109.57
9	53.314781	-1.274462	106.17	2.50	108.67
10	53.314983	-1.273190	106.75	2.50	109.25
11	53.314960	-1.272048	106.61	2.50	109.11
12	53.315554	-1.270585	108.21	2.50	110.71
13	53.319319	-1.271256	104.57	2.50	107.07
14	53.320300	-1.267758	100.49	2.50	102.99
15	53.319934	-1.265237	103.48	2.50	105.98
16	53.317743	-1.266825	107.93	2.50	110.43
17	53.316063	-1.267898	103.05	2.50	105.55
18	53.314826	-1.269754	103.63	2.50	106.13
19	53.313961	-1.272565	104.07	2.50	106.57
20	53.314099	-1.273938	103.75	2.50	106.25
21	53.313542	-1.274883	106.49	2.50	108.99
22	53.310497	-1.273563	107.56	2.50	110.06
23	53.309625	-1.271492	109.55	2.50	112.05
24	53.309426	-1.271793	107.49	2.50	109.99

Name: PRoW 4
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.321765	-1.262211	112.58	2.50	115.08
2	53.320973	-1.265741	97.44	2.50	99.94

Name: PRoW 5
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.323261	-1.277419	111.28	2.50	113.78
2	53.323046	-1.274506	105.38	2.50	107.88
3	53.323178	-1.271588	102.41	2.50	104.91
4	53.323511	-1.267618	92.28	2.50	94.78
5	53.323558	-1.265344	91.67	2.50	94.17
6	53.323697	-1.262530	107.96	2.50	110.46
7	53.323713	-1.261460	110.50	2.50	113.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	8.0	180.0	72,807	1,213.5	76,116	1,268.6	-
PV array 14	8.0	180.0	5,007	83.5	6,624	110.4	-
PV array 3	8.0	180.0	101,980	1,699.7	126,073	2,101.2	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	89,796	1,496.6	92,270	1,537.8
PRoW 10	69,986	1,166.4	72,525	1,208.8
PRoW 11	3,543	59.0	6,335	105.6
PRoW 2	11,370	189.5	32,591	543.2
PRoW 4	2,760	46.0	1,678	28.0
PRoW 5	2,339	39.0	3,414	56.9

PV: PV array 10

potential temporary after-image

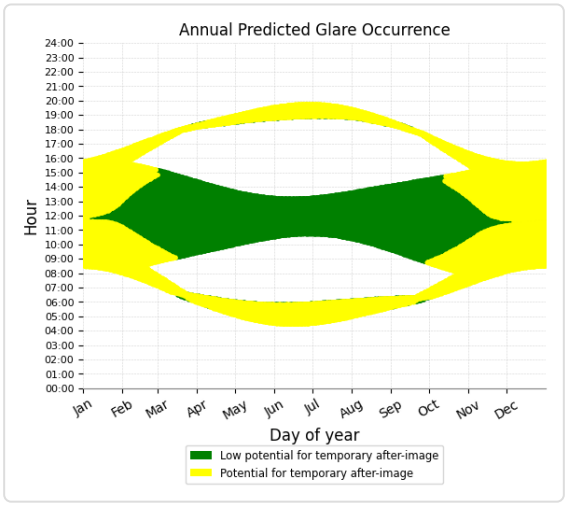
Receptor results ordered by category of glare

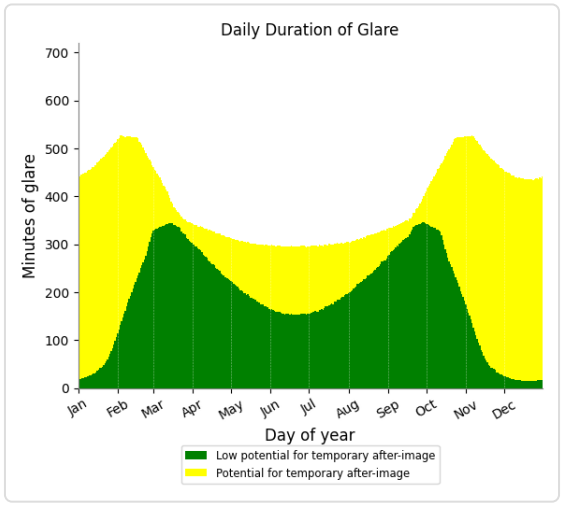
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 10	69,986	1,166.4	72,525	1,208.8
PRoW 4	816	13.6	177	3.0
PRoW 5	2,005	33.4	3,414	56.9
PRoW 1	0	0.0	0	0.0
PRoW 11	0	0.0	0	0.0
PRoW 2	0	0.0	0	0.0

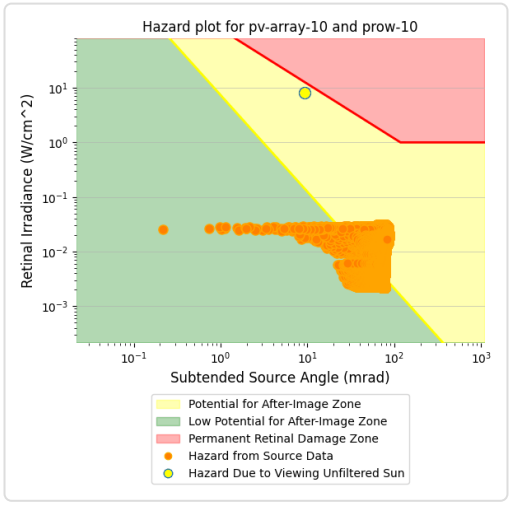
PV array 10 and Route: PRoW 10

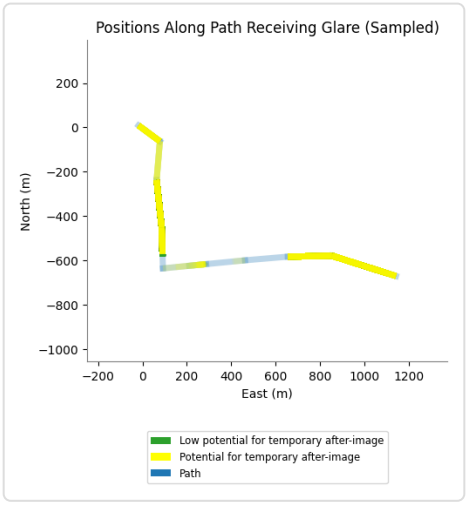
Yellow glare: 72,525 min.

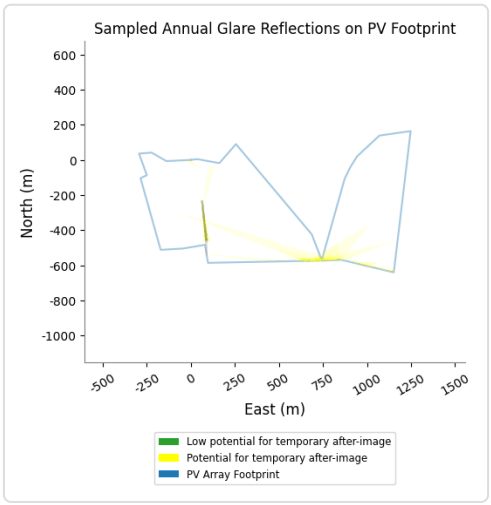
Green glare: 69,986 min.







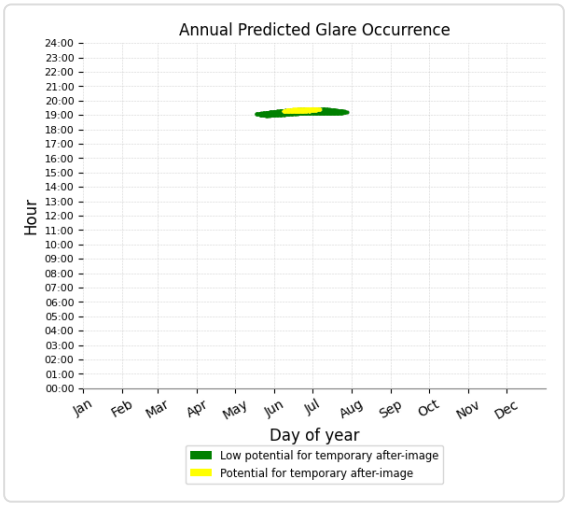


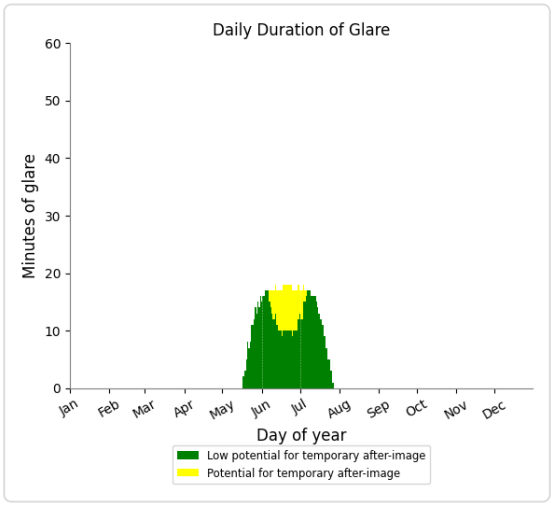


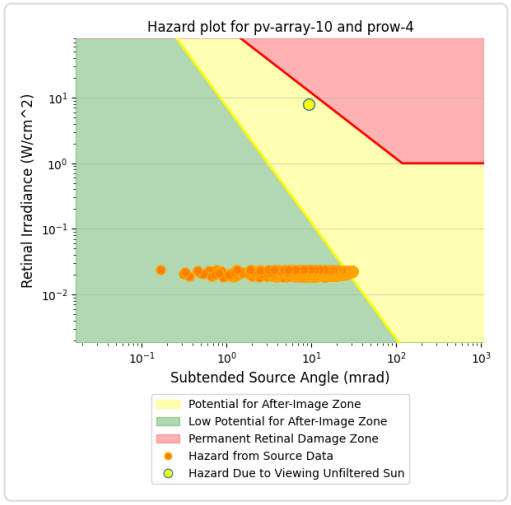
PV array 10 and Route: PRoW 4

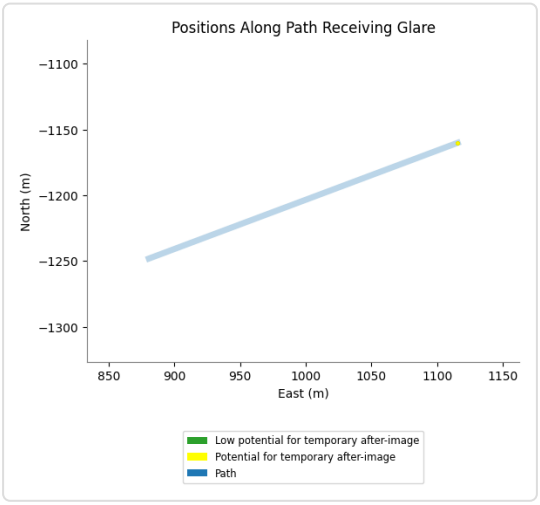
Yellow glare: 177 min.

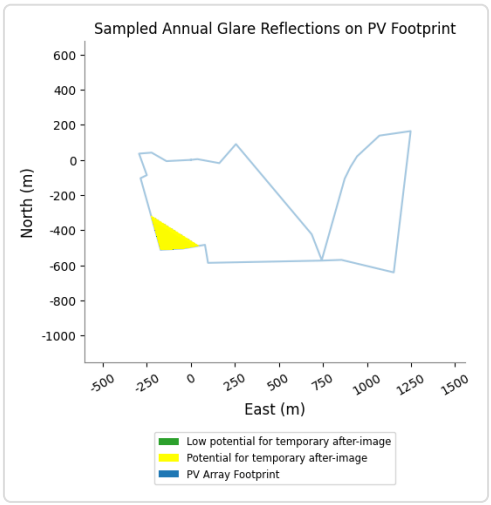
Green glare: 816 min.







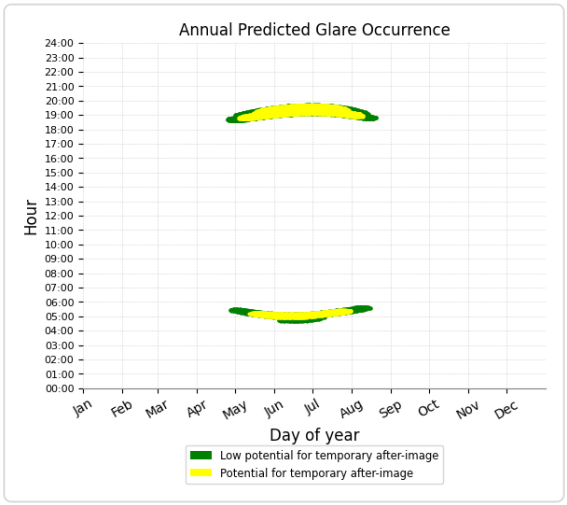


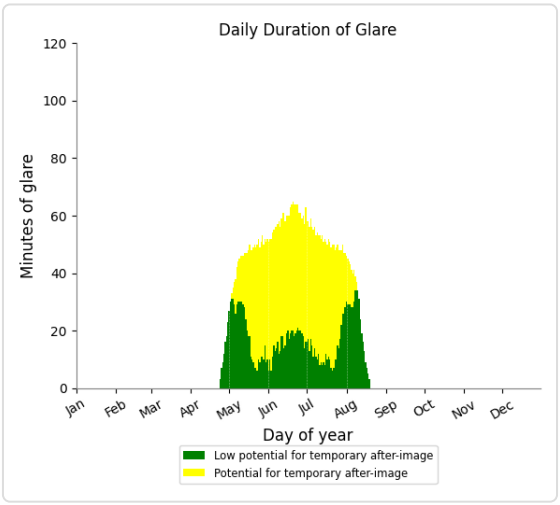


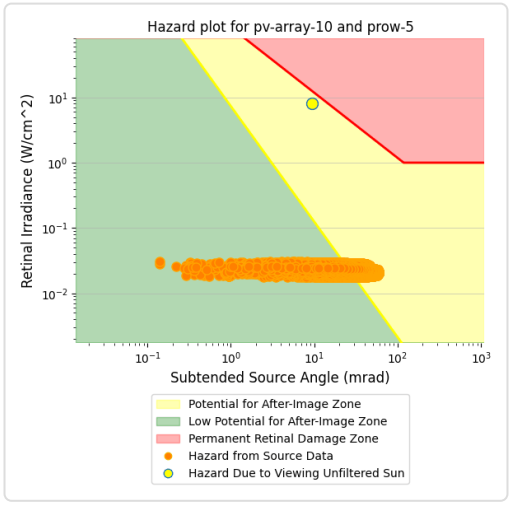
PV array 10 and Route: PRoW 5

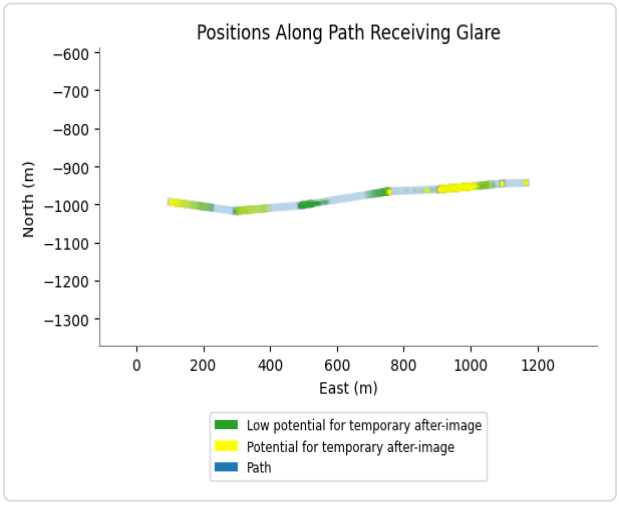
Yellow glare: 3,414 min.

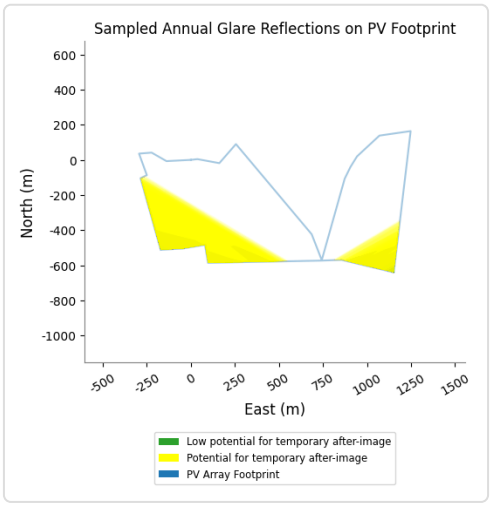
Green glare: 2,005 min.











PV array 10 and Route: PRoW 1

No glare found

PV array 10 and Route: PRoW 11

No glare found

PV array 10 and Route: PRoW 2

No glare found

PV: PV array 14 potential temporary after-image

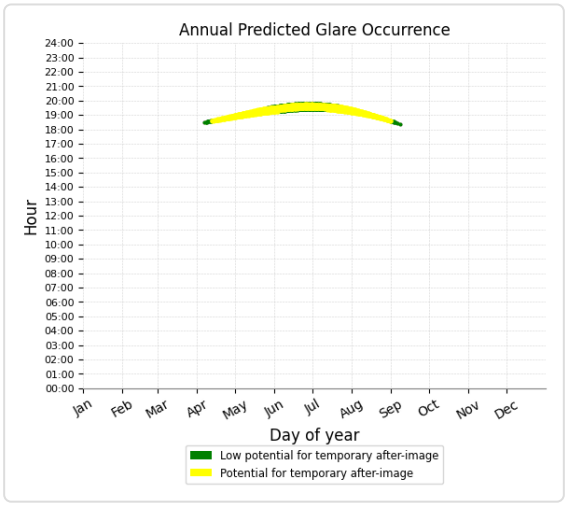
Receptor results ordered by category of glare

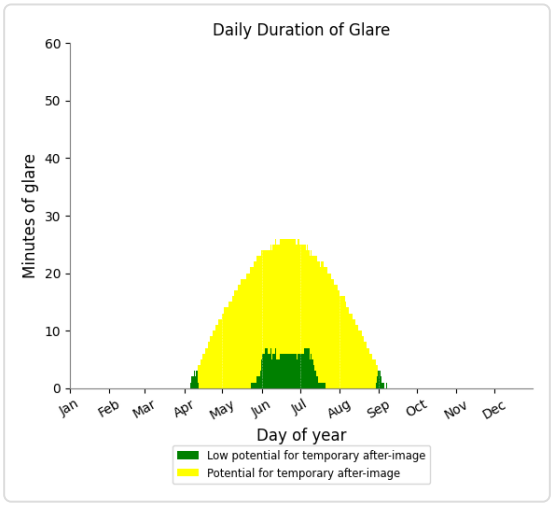
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	304	5.1	2,199	36.6
PRoW 11	2,387	39.8	2,174	36.2
PRoW 2	1,374	22.9	2,188	36.5
PRoW 4	608	10.1	63	1.1
PRoW 5	334	5.6	0	0.0
PRoW 10	0	0.0	0	0.0

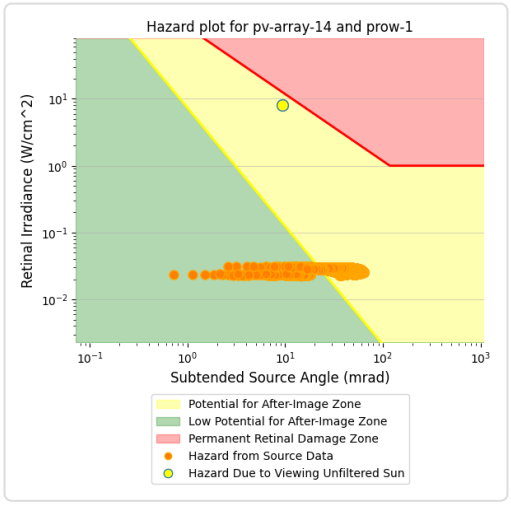
PV array 14 and Route: PRoW 1

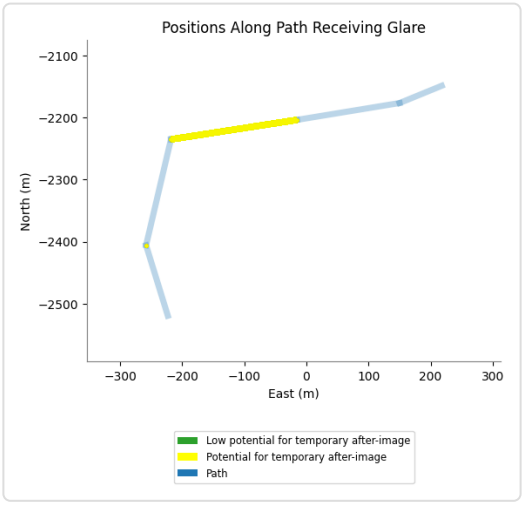
Yellow glare: 2,199 min.

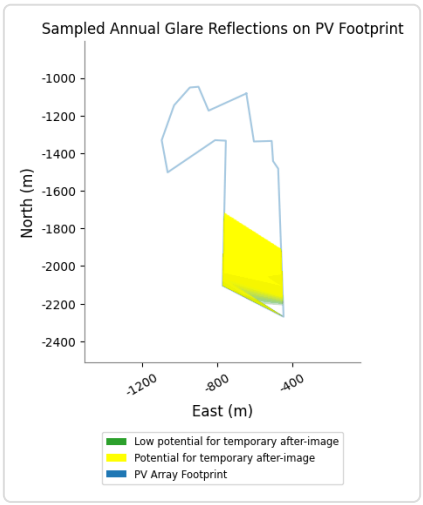
Green glare: 304 min.







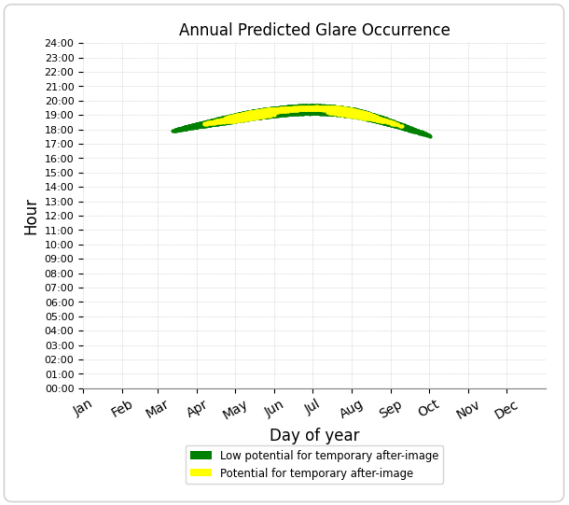


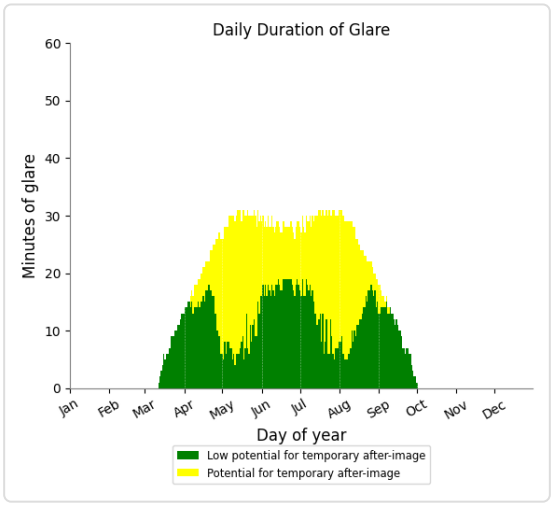


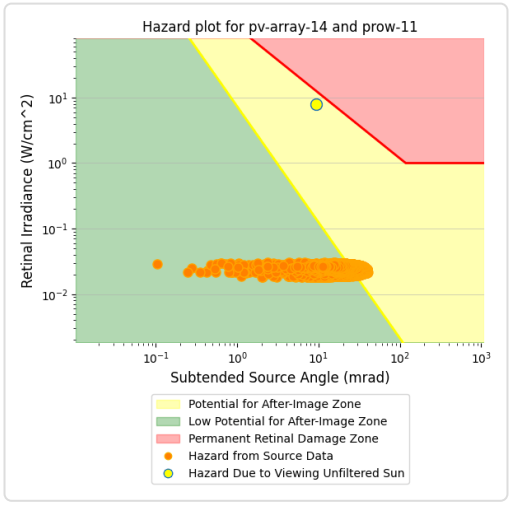
PV array 14 and Route: PRoW 11

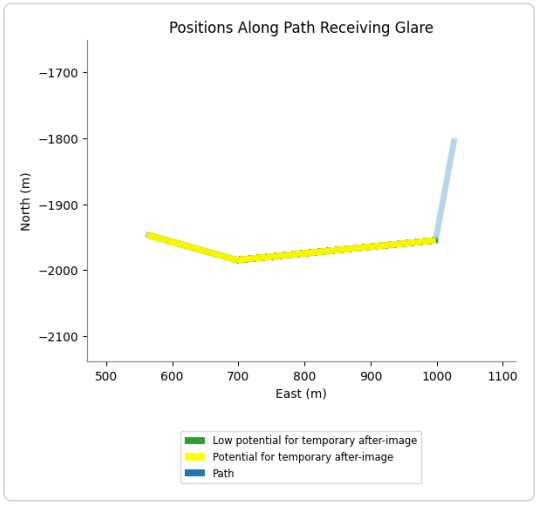
Yellow glare: 2,174 min.

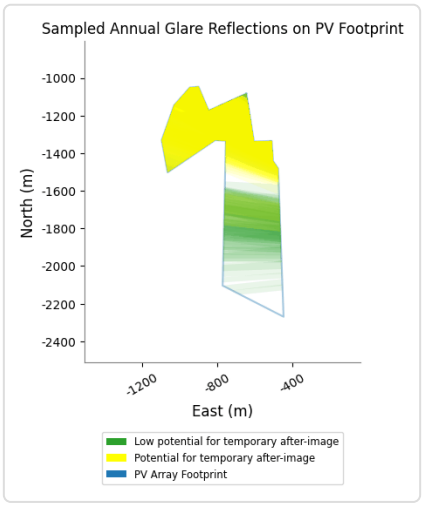
Green glare: 2,387 min.







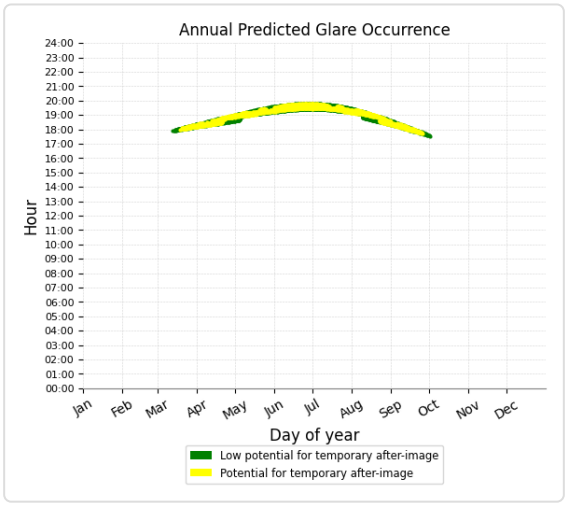


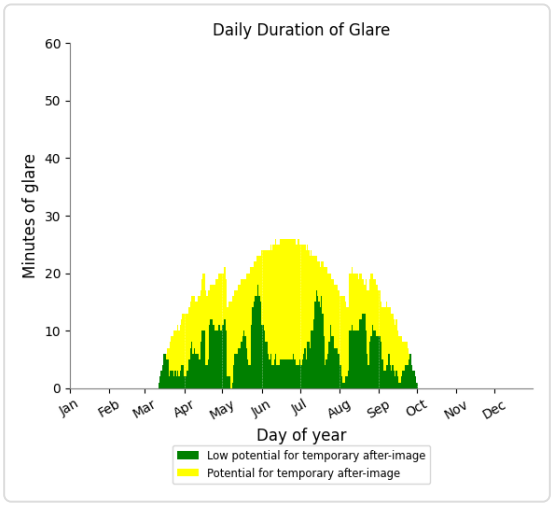


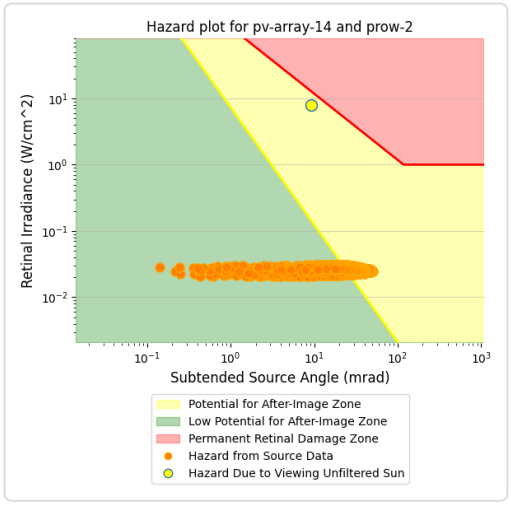
PV array 14 and Route: PRoW 2

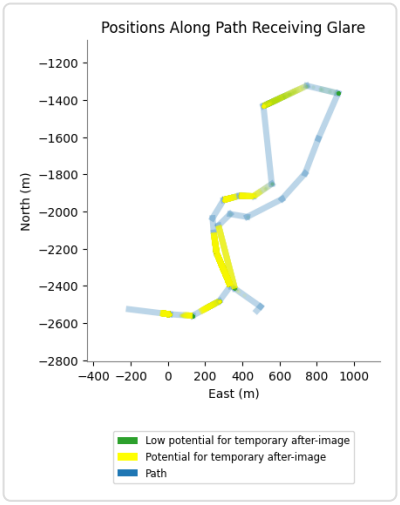
Yellow glare: 2,188 min.

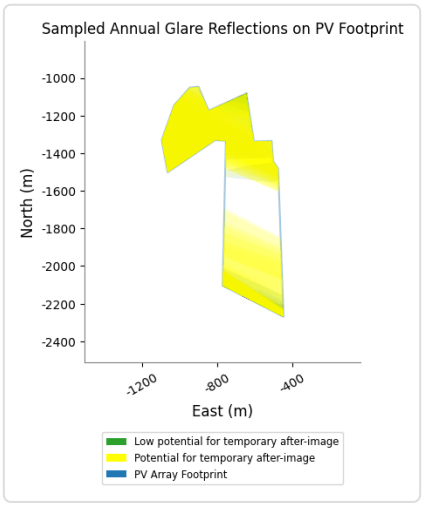
Green glare: 1,374 min.







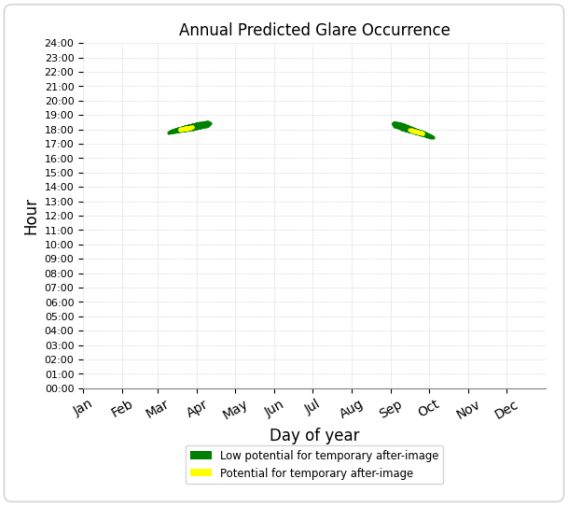


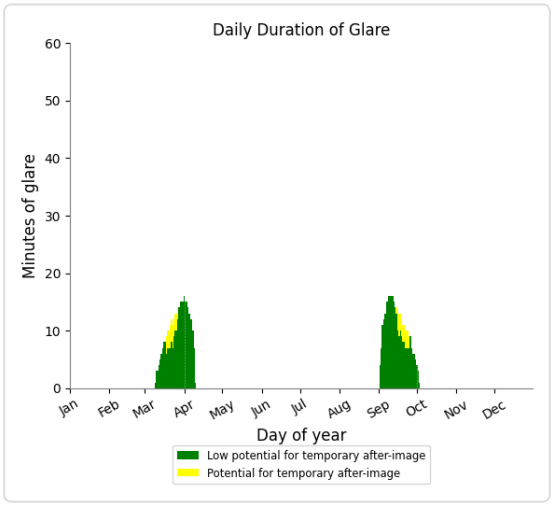


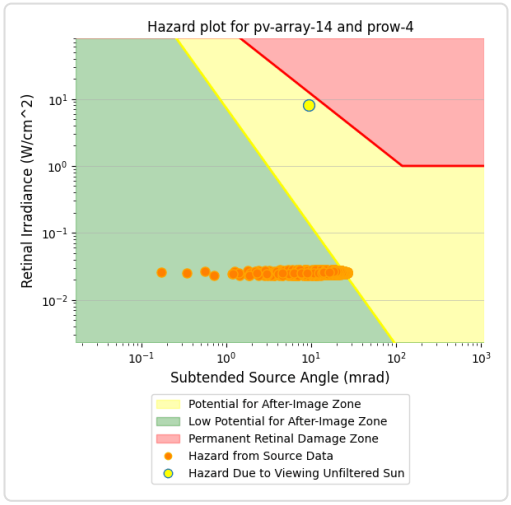
PV array 14 and Route: PRoW 4

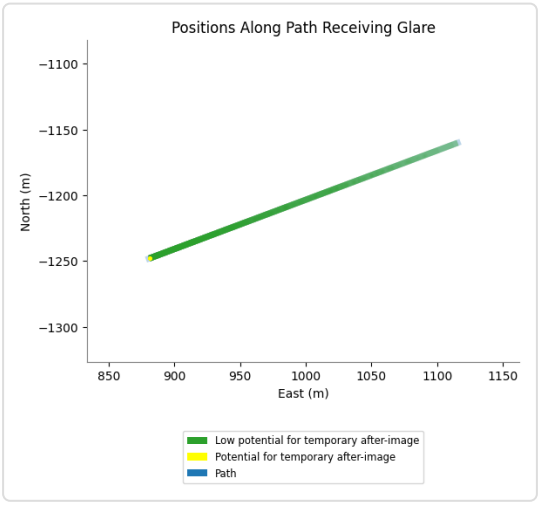
Yellow glare: 63 min.

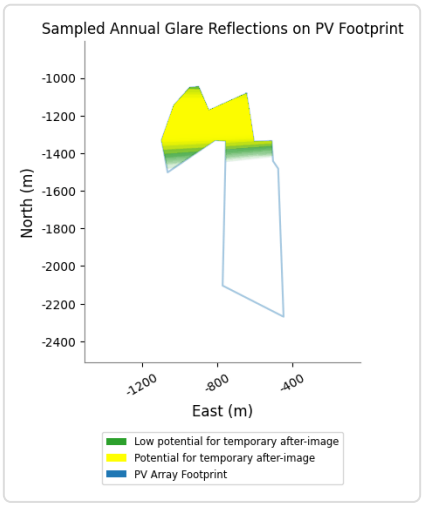
Green glare: 608 min.







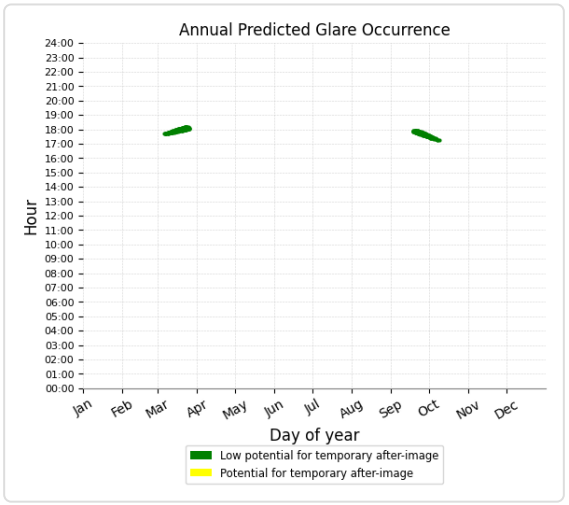


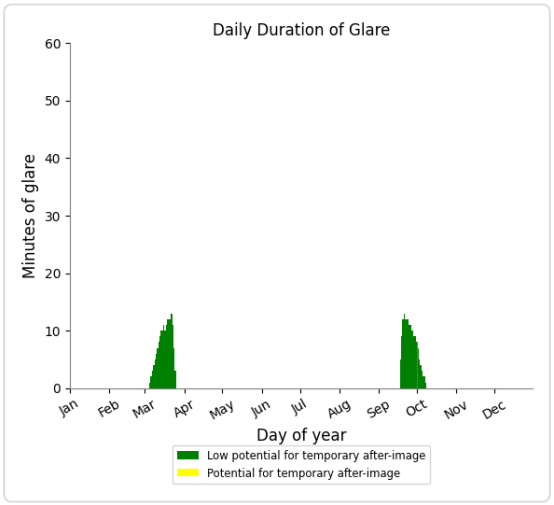


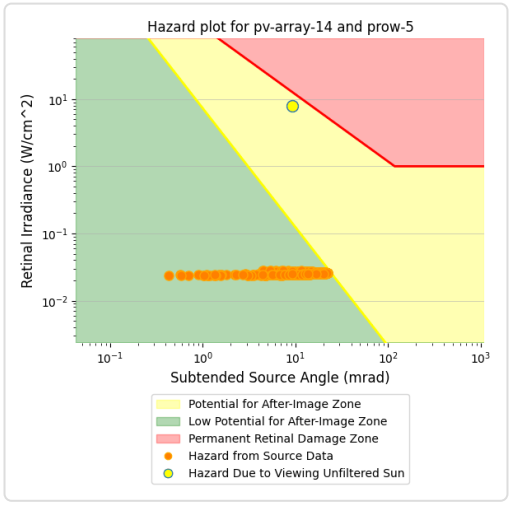
PV array 14 and Route: PRoW 5

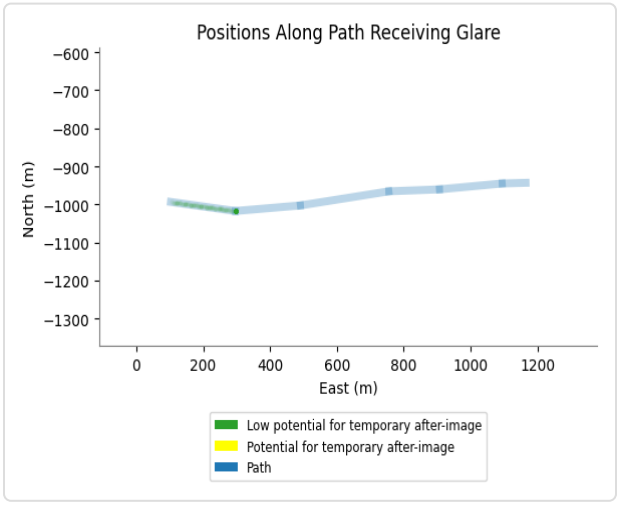
Yellow glare: none

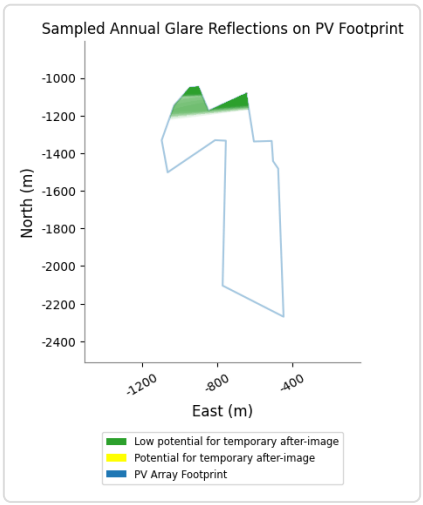
Green glare: 334 min.











PV array 14 and Route: PRoW 10

No glare found

PV: PV array 3 potential temporary after-image

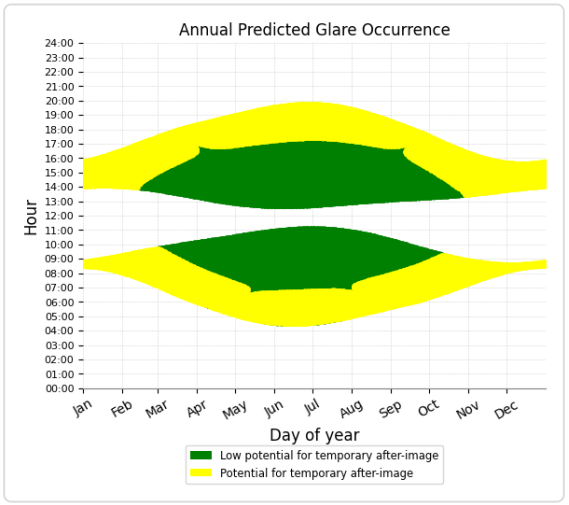
Receptor results ordered by category of glare

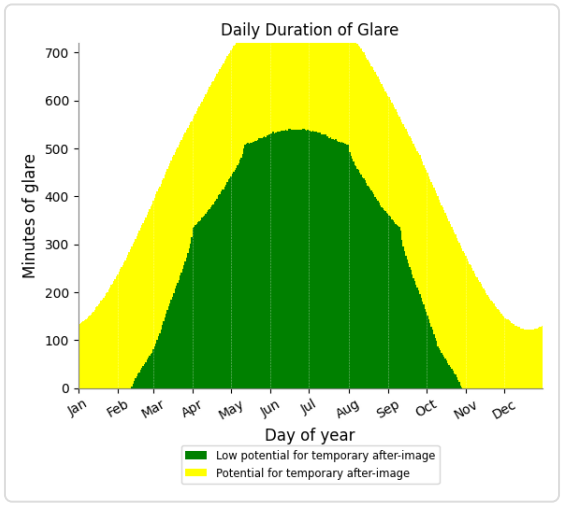
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	89,492	1,491.5	90,071	1,501.2
PRoW 11	1,156	19.3	4,161	69.3
PRoW 2	9,996	166.6	30,403	506.7
PRoW 4	1,336	22.3	1,438	24.0
PRoW 10	0	0.0	0	0.0
PRoW 5	0	0.0	0	0.0

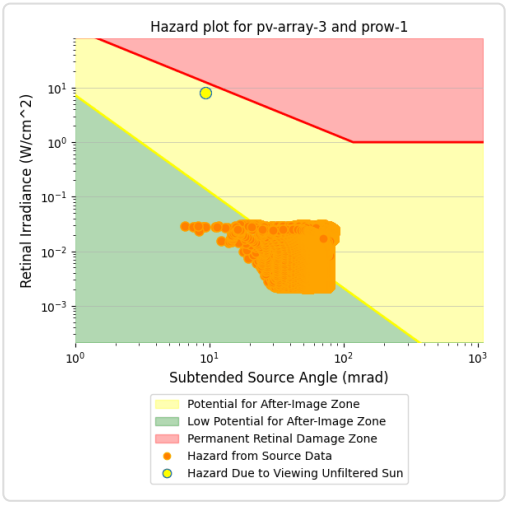
PV array 3 and Route: PRoW 1

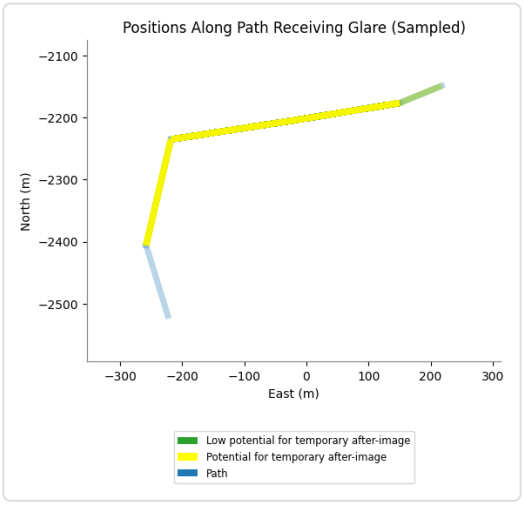
Yellow glare: 90,071 min.

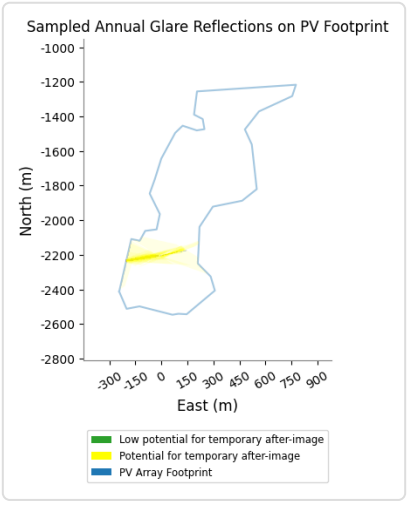
Green glare: 89,492 min.







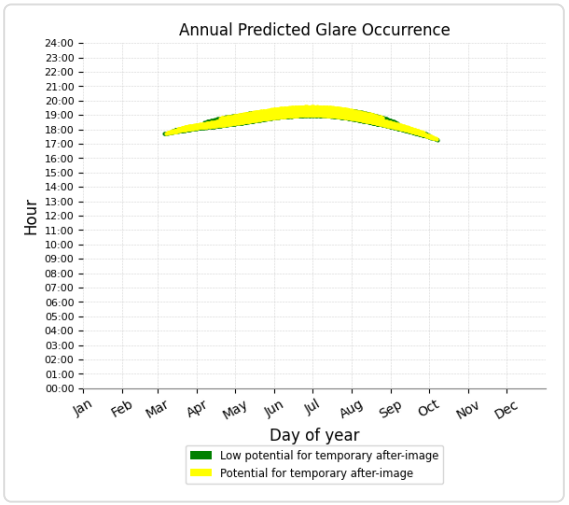


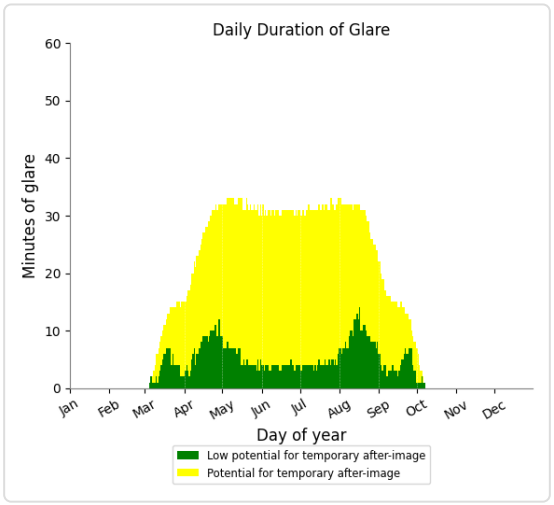


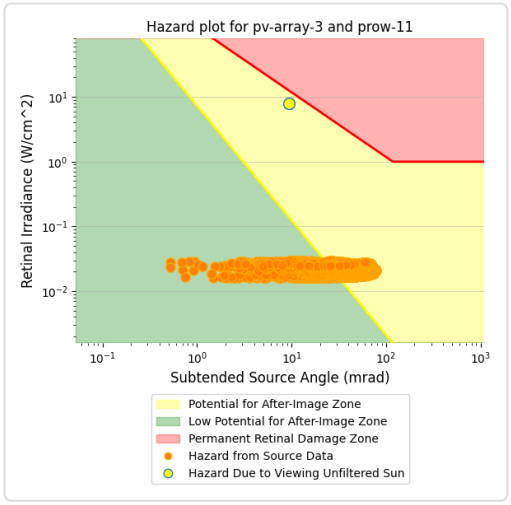
PV array 3 and Route: PRoW 11

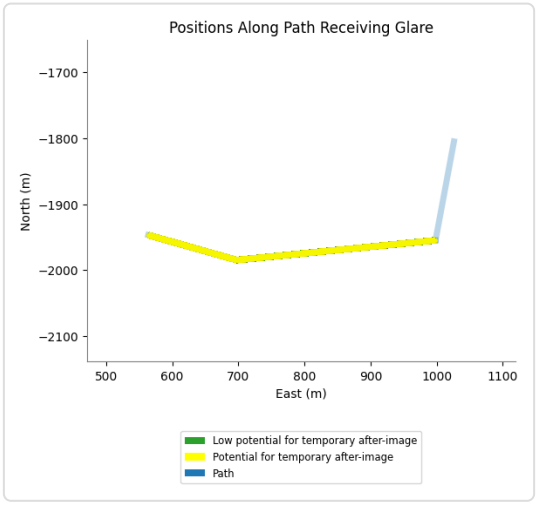
Yellow glare: 4,161 min.

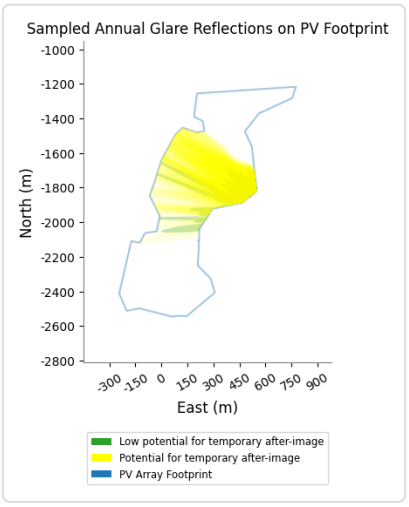
Green glare: 1,156 min.







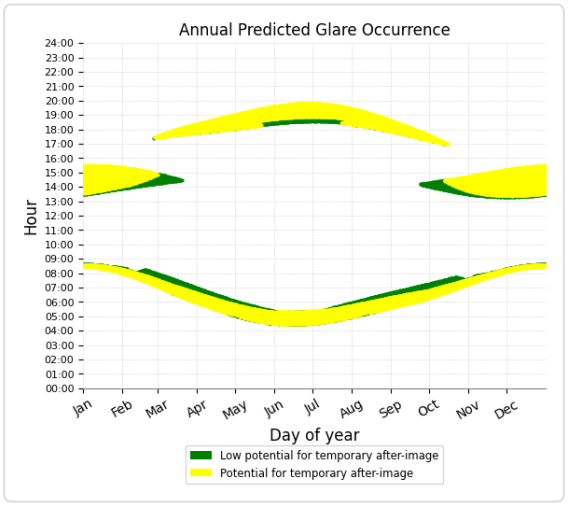


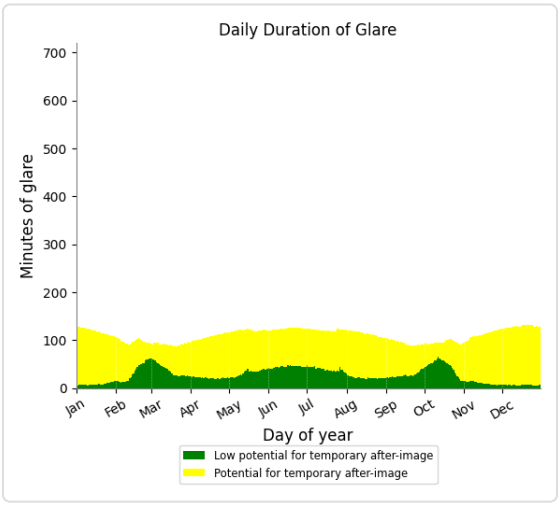


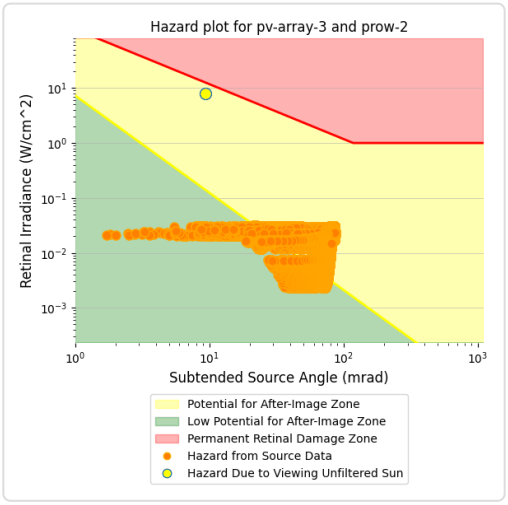
PV array 3 and Route: PRoW 2

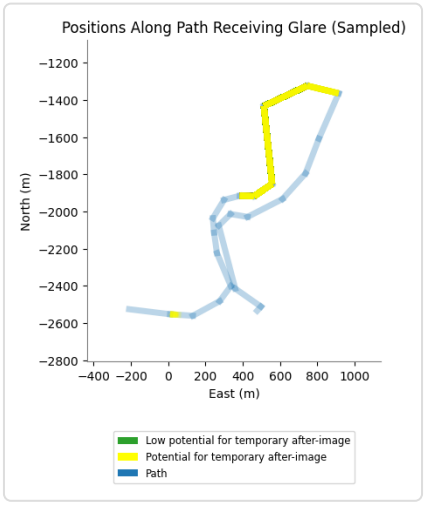
Yellow glare: 30,403 min.

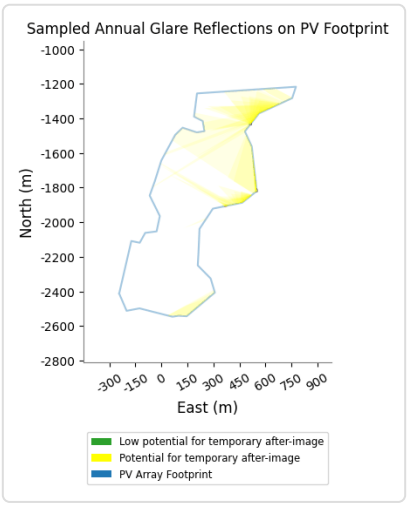
Green glare: 9,996 min.







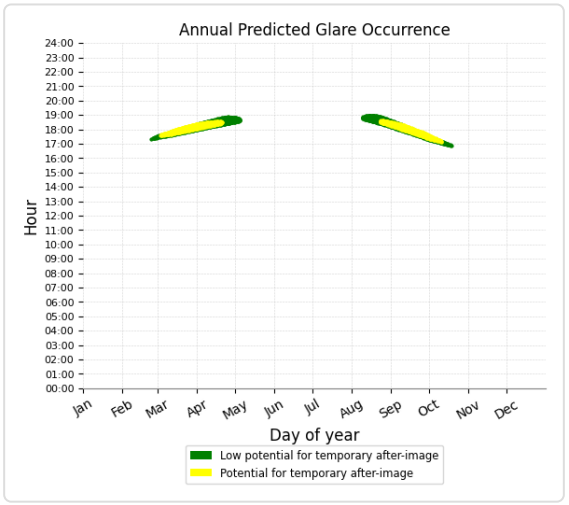


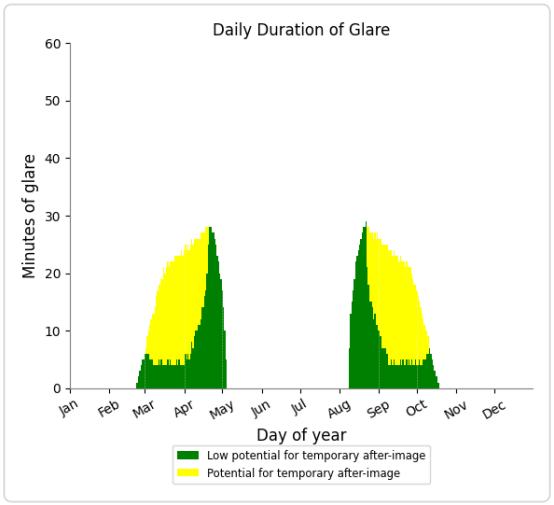


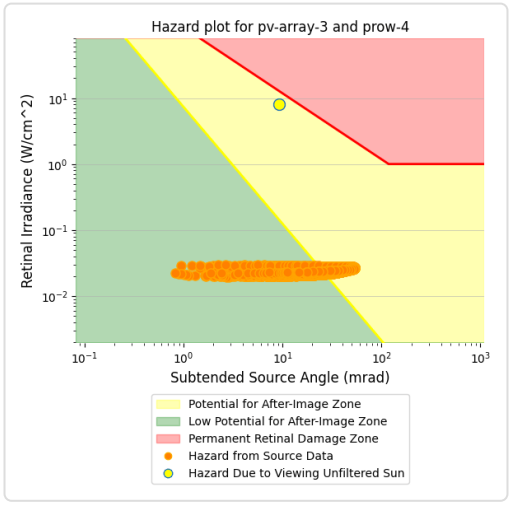
PV array 3 and Route: PRoW 4

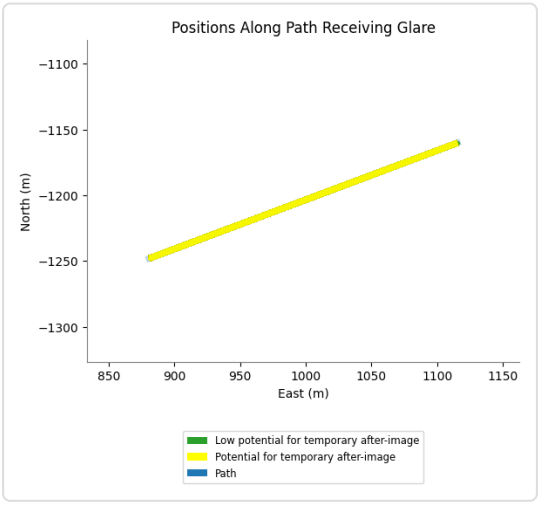
Yellow glare: 1,438 min.

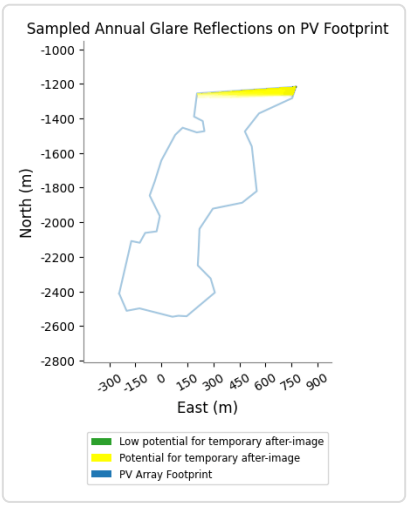
Green glare: 1,336 min.











PV array 3 and Route: PRoW 10

No glare found

PV array 3 and Route: PRoW 5

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

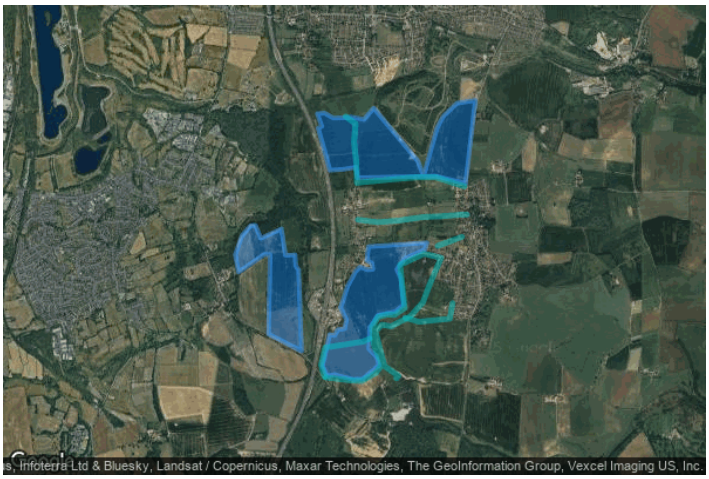
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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 3**
Site configuration: **JS W3 - PRoWs**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153796.25517

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	25.0	180.0	52,378	873.0	39,910	665.2	-
PV array 14	25.0	180.0	2,982	49.7	8,458	141.0	-
PV array 3	25.0	180.0	151,688	2,528.1	82,044	1,367.4	-

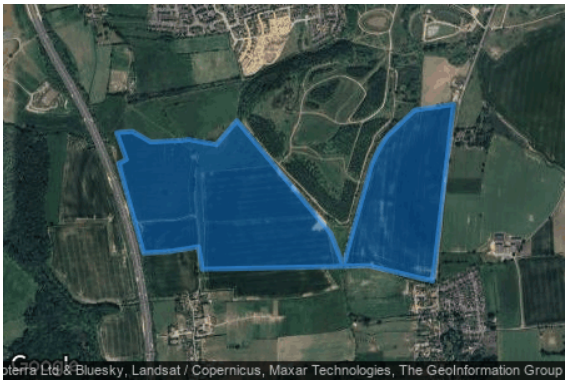
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	144,180	2,403.0	63,161	1,052.7
PRoW 10	50,648	844.1	38,754	645.9
PRoW 11	1,994	33.2	6,277	104.6
PRoW 2	6,858	114.3	19,776	329.6
PRoW 4	1,577	26.3	1,288	21.5
PRoW 5	1,791	29.9	1,156	19.3

Component Data

PV Arrays

Name: PV array 10
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332187	-1.278957	90.29	3.80	94.09
2	53.332123	-1.281038	93.39	3.80	97.19
3	53.332559	-1.282304	96.34	3.80	100.14
4	53.332507	-1.283377	99.28	3.80	103.08
5	53.331405	-1.282712	97.51	3.80	101.31
6	53.331252	-1.283248	100.06	3.80	103.86
7	53.327587	-1.281531	105.78	3.80	109.58
8	53.327651	-1.279665	115.20	3.80	119.00
9	53.327843	-1.277755	105.29	3.80	109.09
10	53.326920	-1.277497	106.91	3.80	110.71
11	53.327036	-1.267863	90.02	3.80	93.82
12	53.327074	-1.266125	91.84	3.80	95.64
13	53.326433	-1.261662	99.50	3.80	103.30
14	53.333661	-1.260224	89.56	3.80	93.36
15	53.333430	-1.262885	88.21	3.80	92.01
16	53.332367	-1.264794	90.44	3.80	94.24
17	53.331828	-1.265352	89.00	3.80	92.80
18	53.331226	-1.265846	88.66	3.80	92.46
19	53.327060	-1.267801	90.20	3.80	94.00
20	53.328381	-1.268657	89.34	3.80	93.14
21	53.332994	-1.275116	89.05	3.80	92.85
22	53.332021	-1.276532	88.05	3.80	91.85
23	53.332226	-1.278399	90.83	3.80	94.63

Name: PV array 14
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.322460	-1.288645	97.50	3.80	101.30
2	53.321639	-1.291649	102.80	3.80	106.60
3	53.322780	-1.292454	93.40	3.80	97.20
4	53.322745	-1.293141	93.60	3.80	97.40
5	53.321896	-1.294396	96.50	3.80	100.30
6	53.320230	-1.295383	104.90	3.80	108.70
7	53.318691	-1.294911	109.70	3.80	113.50
8	53.320230	-1.291134	114.20	3.80	118.00
9	53.320204	-1.290276	114.80	3.80	118.60
10	53.313282	-1.290534	137.70	3.80	141.50
11	53.311795	-1.285684	130.10	3.80	133.90
12	53.318871	-1.286113	103.90	3.80	107.70
13	53.319230	-1.286521	102.90	3.80	106.70
14	53.320191	-1.286628	99.20	3.80	103.00
15	53.320165	-1.288044	105.20	3.80	109.00

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.310510	-1.282613	128.50	3.80	132.30
2	53.309613	-1.281969	123.20	3.80	127.00
3	53.309741	-1.280853	123.40	3.80	127.20
4	53.309305	-1.277999	116.70	3.80	120.50
5	53.309357	-1.277484	116.30	3.80	120.10
6	53.309331	-1.276776	113.30	3.80	117.10
7	53.310562	-1.274330	105.20	3.80	109.00
8	53.311292	-1.274695	105.50	3.80	109.30
9	53.311972	-1.275810	107.30	3.80	111.10
10	53.312651	-1.275746	105.90	3.80	109.70
11	53.313869	-1.275660	104.40	3.80	108.20
12	53.314920	-1.274502	103.80	3.80	107.60
13	53.315228	-1.271970	105.20	3.80	109.00
14	53.315831	-1.270704	104.50	3.80	108.30
15	53.318151	-1.271133	104.70	3.80	108.50
16	53.318933	-1.271733	104.80	3.80	108.60
17	53.319868	-1.270510	101.50	3.80	105.30
18	53.320663	-1.267635	95.70	3.80	99.50
19	53.321253	-1.267313	95.10	3.80	98.90
20	53.320907	-1.275875	110.60	3.80	114.40
21	53.319702	-1.276132	113.30	3.80	117.10
22	53.319471	-1.275381	114.10	3.80	117.90
23	53.318945	-1.275231	116.50	3.80	120.30
24	53.318881	-1.275896	119.00	3.80	122.80
25	53.319125	-1.277119	114.60	3.80	118.40
26	53.318753	-1.277763	113.90	3.80	117.70
27	53.317420	-1.278965	117.70	3.80	121.50
28	53.316356	-1.279523	117.50	3.80	121.30
29	53.315600	-1.279973	121.80	3.80	125.60
30	53.314536	-1.279093	119.30	3.80	123.10
31	53.313738	-1.279373	121.00	3.80	124.80
32	53.313662	-1.280360	125.70	3.80	129.50
33	53.313149	-1.280833	128.20	3.80	132.00
34	53.313238	-1.281562	128.30	3.80	132.10

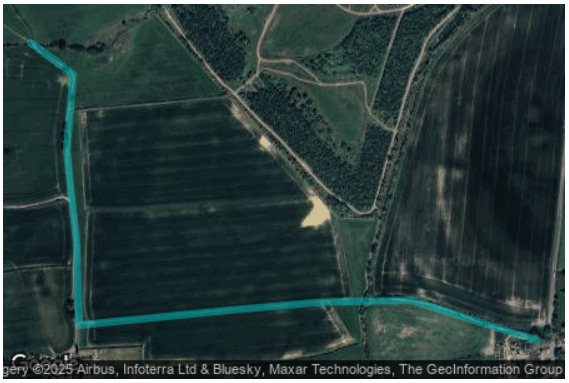
Route Receptors

Name: PRoW 1
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.309550	-1.282304	124.40	2.50	126.90
2	53.310569	-1.282830	129.95	2.50	132.45
3	53.312101	-1.282229	128.61	2.50	131.11
4	53.312383	-1.279182	125.60	2.50	128.10
5	53.312627	-1.276704	110.95	2.50	113.45
6	53.312877	-1.275684	108.02	2.50	110.52

Name: PRoW 10
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332266	-1.279219	91.06	2.50	93.56
2	53.331625	-1.277776	89.19	2.50	91.69
3	53.330055	-1.277997	93.59	2.50	96.09
4	53.328133	-1.277654	105.11	2.50	107.61
5	53.326479	-1.277570	107.59	2.50	110.09
6	53.326652	-1.274652	96.59	2.50	99.09
7	53.326805	-1.272023	93.67	2.50	96.17
8	53.326953	-1.269137	90.12	2.50	92.62
9	53.326990	-1.266152	92.31	2.50	94.81
10	53.326611	-1.264167	94.24	2.50	96.74
11	53.326169	-1.261828	99.74	2.50	102.24

Name: PRoW 11
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.315971	-1.263552	119.81	2.50	122.31
2	53.314625	-1.263970	124.28	2.50	126.78
3	53.314356	-1.268487	105.01	2.50	107.51
4	53.314695	-1.270494	105.80	2.50	108.30

Name: PRoW 2
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.309499	-1.282095	124.49	2.50	126.99
2	53.309255	-1.278796	119.41	2.50	121.91
3	53.309183	-1.276969	113.97	2.50	116.47
4	53.309888	-1.274813	107.52	2.50	110.02
5	53.310619	-1.273912	107.01	2.50	109.51
6	53.312209	-1.275028	111.96	2.50	114.46
7	53.313201	-1.275261	110.08	2.50	112.58
8	53.313899	-1.275358	107.07	2.50	109.57
9	53.314781	-1.274462	106.17	2.50	108.67
10	53.314983	-1.273190	106.75	2.50	109.25
11	53.314960	-1.272048	106.61	2.50	109.11
12	53.315554	-1.270585	108.21	2.50	110.71
13	53.319319	-1.271256	104.57	2.50	107.07
14	53.320300	-1.267758	100.49	2.50	102.99
15	53.319934	-1.265237	103.48	2.50	105.98
16	53.317743	-1.266825	107.93	2.50	110.43
17	53.316063	-1.267898	103.05	2.50	105.55
18	53.314826	-1.269754	103.63	2.50	106.13
19	53.313961	-1.272565	104.07	2.50	106.57
20	53.314099	-1.273938	103.75	2.50	106.25
21	53.313542	-1.274883	106.49	2.50	108.99
22	53.310497	-1.273563	107.56	2.50	110.06
23	53.309625	-1.271492	109.55	2.50	112.05
24	53.309426	-1.271793	107.49	2.50	109.99

Name: PRoW 4
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.321765	-1.262211	112.58	2.50	115.08
2	53.320973	-1.265741	97.44	2.50	99.94

Name: PRoW 5
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.323261	-1.277419	111.28	2.50	113.78
2	53.323046	-1.274506	105.38	2.50	107.88
3	53.323178	-1.271588	102.41	2.50	104.91
4	53.323511	-1.267618	92.28	2.50	94.78
5	53.323558	-1.265344	91.67	2.50	94.17
6	53.323697	-1.262530	107.96	2.50	110.46
7	53.323713	-1.261460	110.50	2.50	113.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	25.0	180.0	52,378	873.0	39,910	665.2	-
PV array 14	25.0	180.0	2,982	49.7	8,458	141.0	-
PV array 3	25.0	180.0	151,688	2,528.1	82,044	1,367.4	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	144,180	2,403.0	63,161	1,052.7
PRoW 10	50,648	844.1	38,754	645.9
PRoW 11	1,994	33.2	6,277	104.6
PRoW 2	6,858	114.3	19,776	329.6
PRoW 4	1,577	26.3	1,288	21.5
PRoW 5	1,791	29.9	1,156	19.3

PV: PV array 10

potential temporary after-image

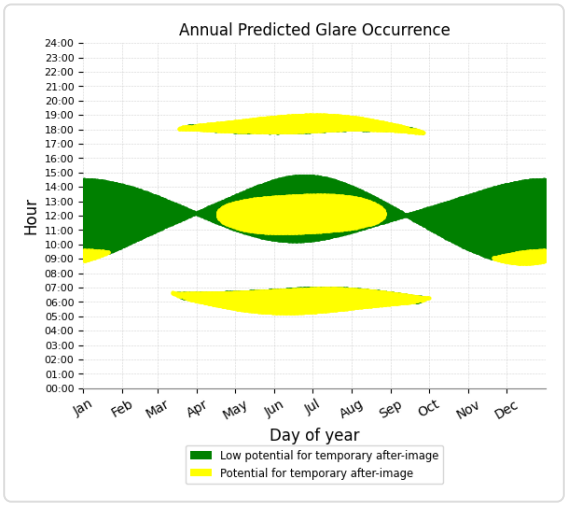
Receptor results ordered by category of glare

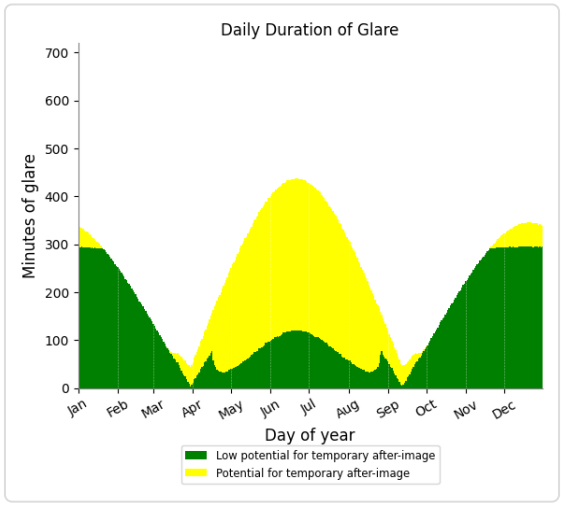
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 10	50,648	844.1	38,754	645.9
PRoW 5	1,730	28.8	1,156	19.3
PRoW 1	0	0.0	0	0.0
PRoW 11	0	0.0	0	0.0
PRoW 2	0	0.0	0	0.0
PRoW 4	0	0.0	0	0.0

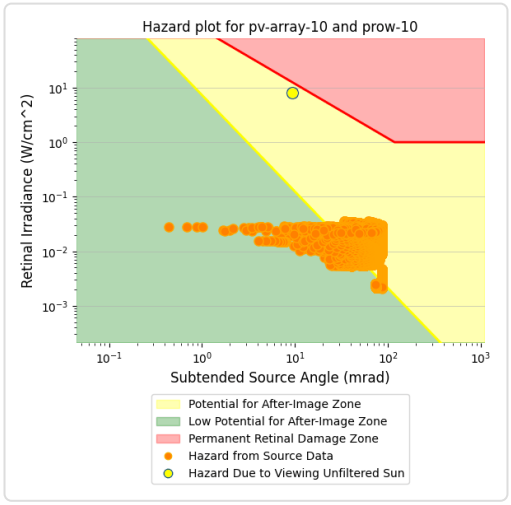
PV array 10 and Route: PRoW 10

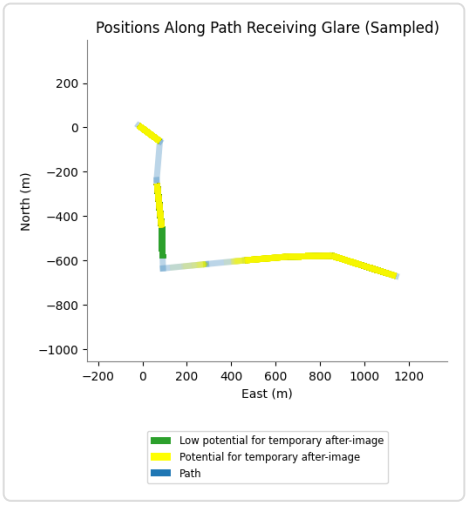
Yellow glare: 38,754 min.

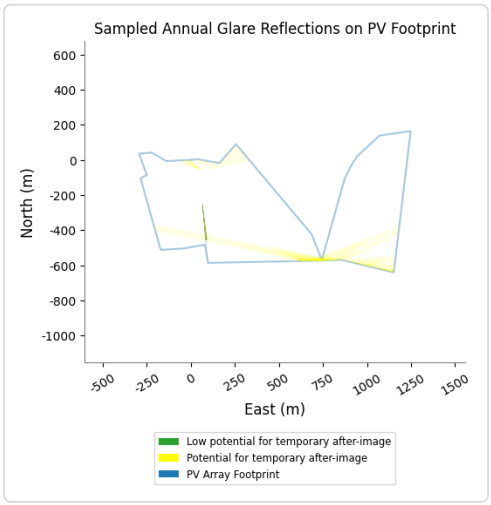
Green glare: 50,648 min.







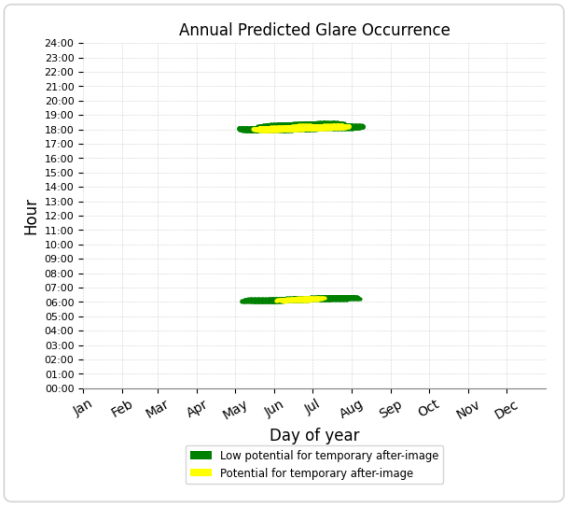


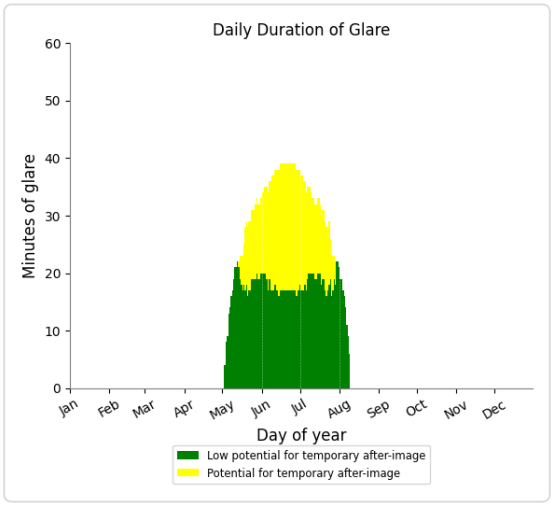


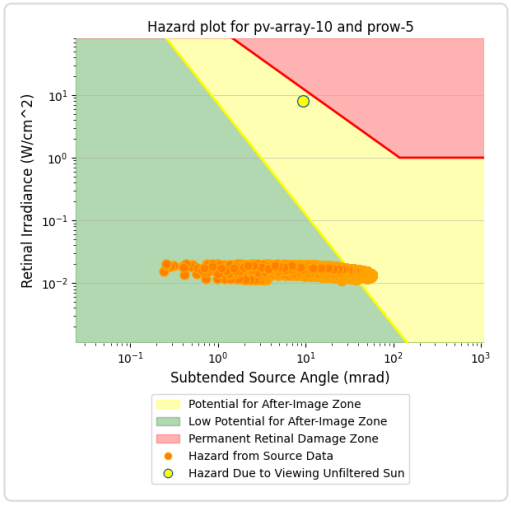
PV array 10 and Route: PRoW 5

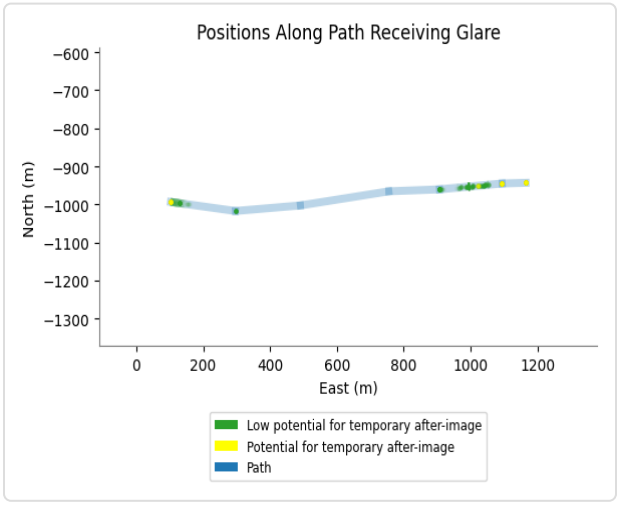
Yellow glare: 1,156 min.

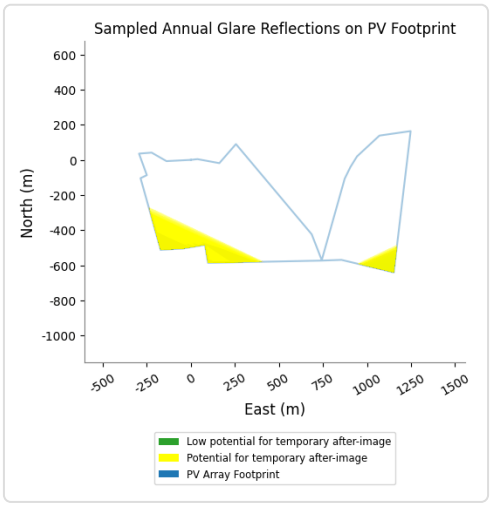
Green glare: 1,730 min.











PV array 10 and Route: PRoW 1

No glare found

PV array 10 and Route: PRoW 11

No glare found

PV array 10 and Route: PRoW 2

No glare found

PV array 10 and Route: PRoW 4

No glare found

PV: PV array 14 potential temporary after-image

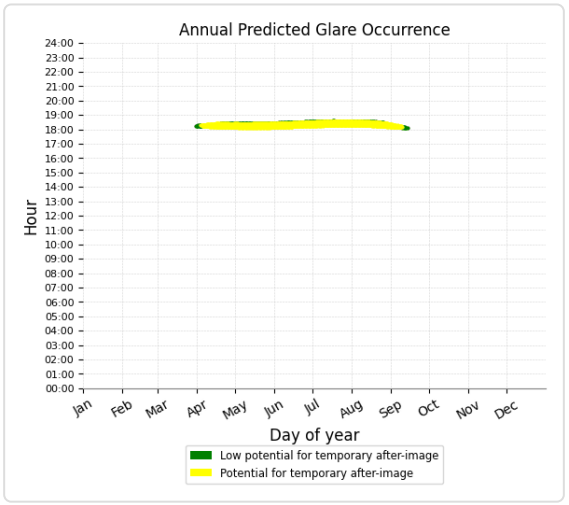
Receptor results ordered by category of glare

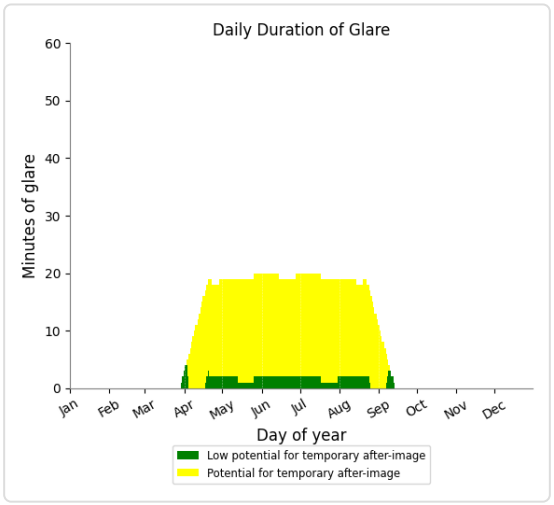
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	264	4.4	2,555	42.6
PRoW 11	1,141	19.0	2,857	47.6
PRoW 2	1,144	19.1	2,997	50.0
PRoW 4	372	6.2	49	0.8
PRoW 5	61	1.0	0	0.0
PRoW 10	0	0.0	0	0.0

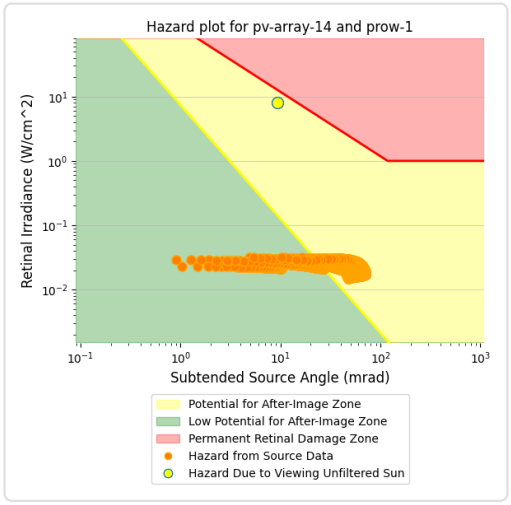
PV array 14 and Route: PRoW 1

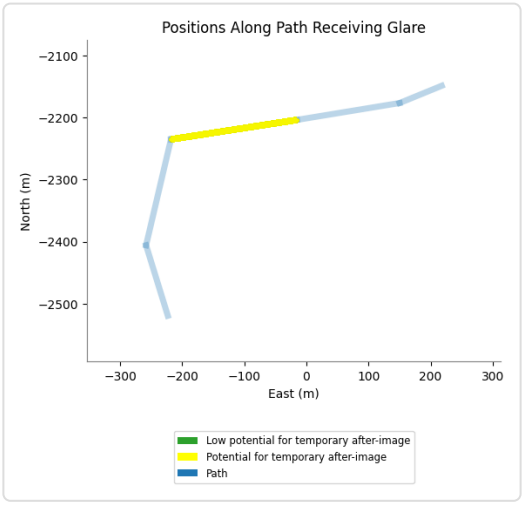
Yellow glare: 2,555 min.

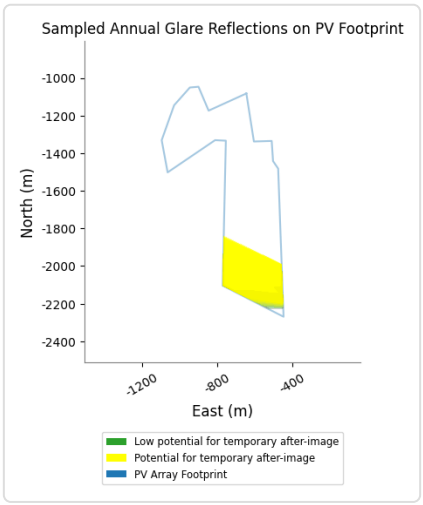
Green glare: 264 min.







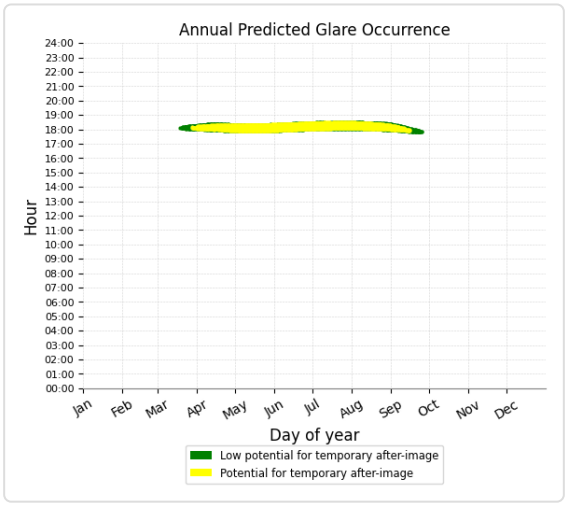


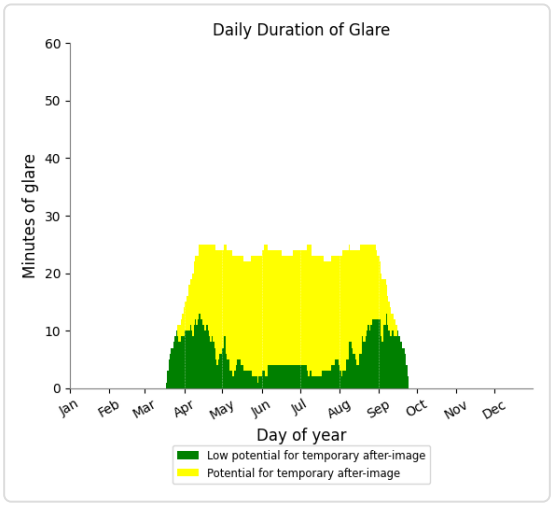


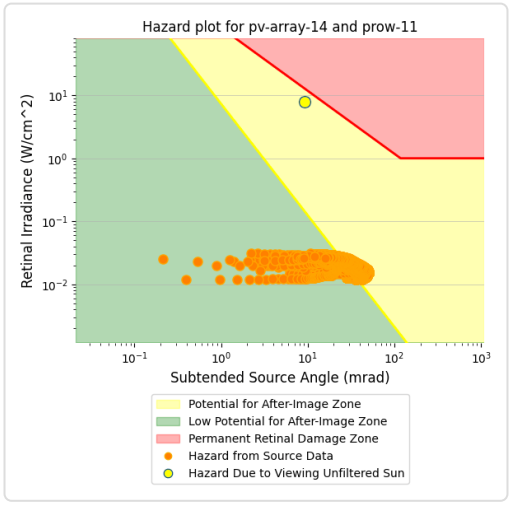
PV array 14 and Route: PRoW 11

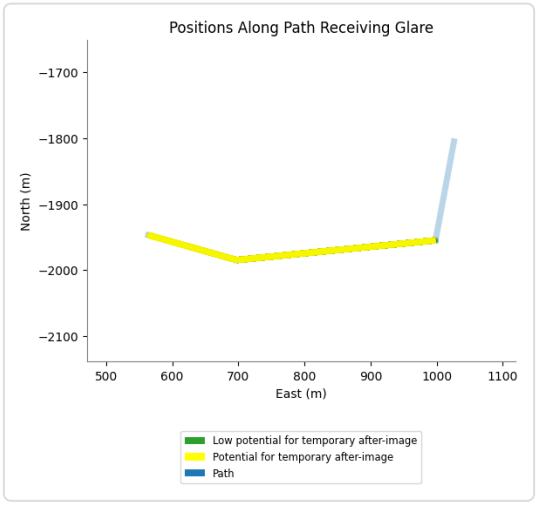
Yellow glare: 2,857 min.

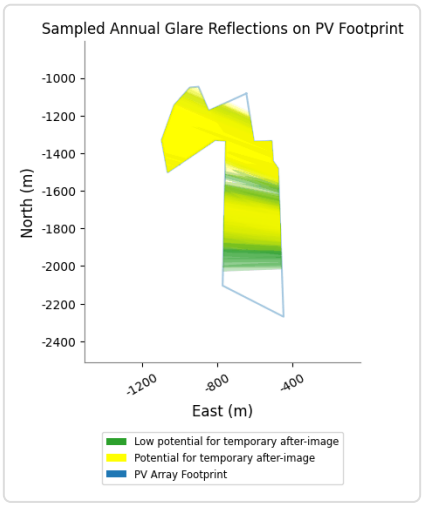
Green glare: 1,141 min.







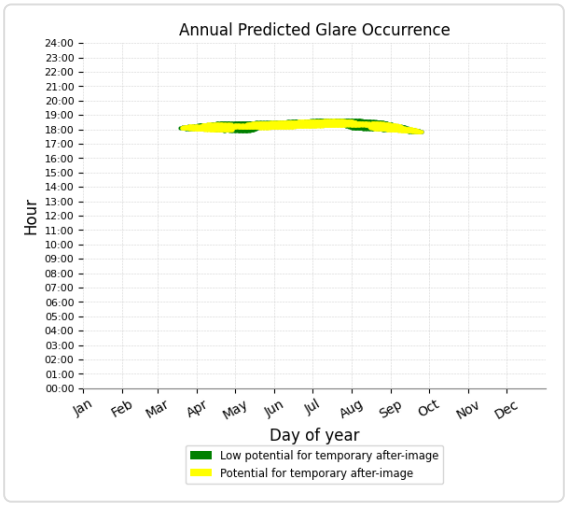


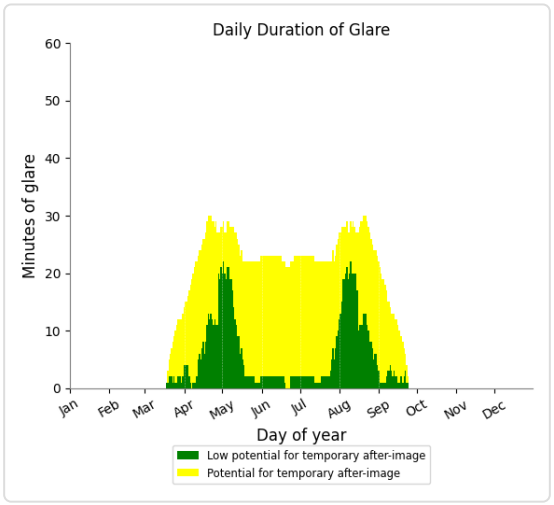


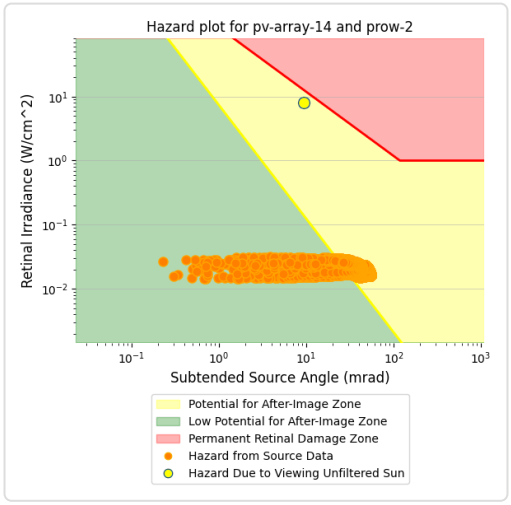
PV array 14 and Route: PRoW 2

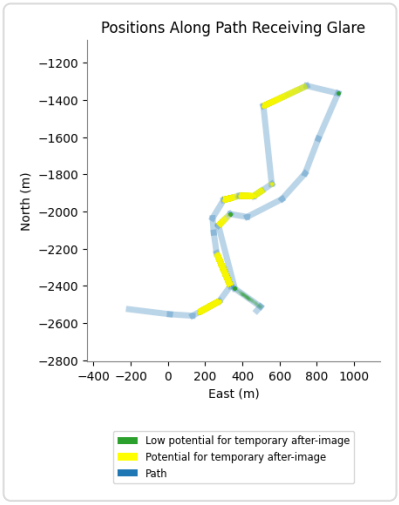
Yellow glare: 2,997 min.

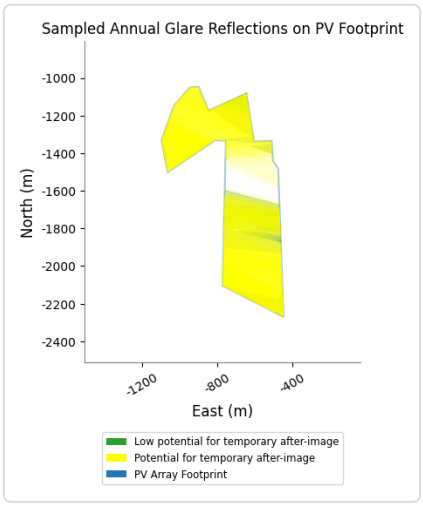
Green glare: 1,144 min.







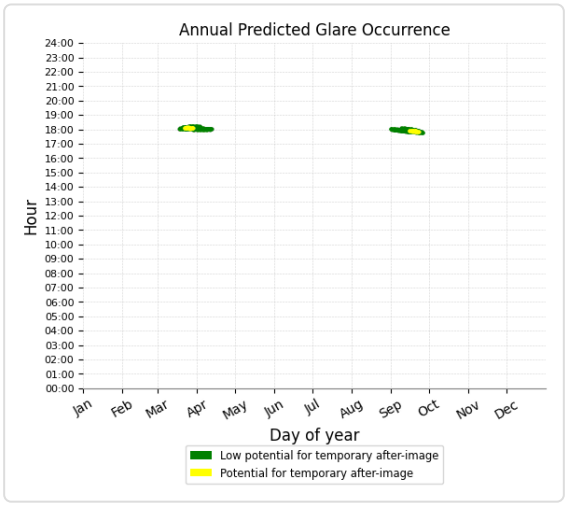


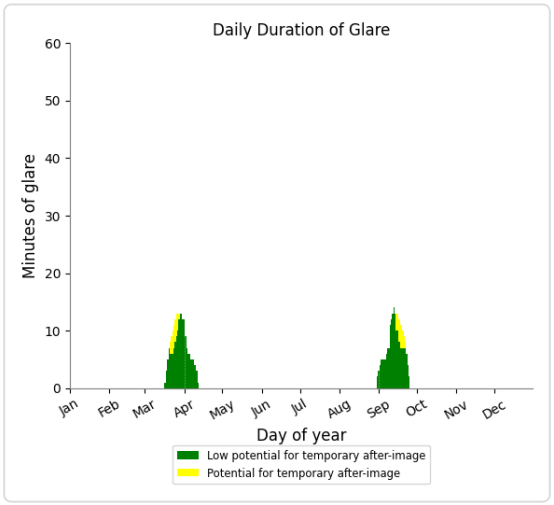


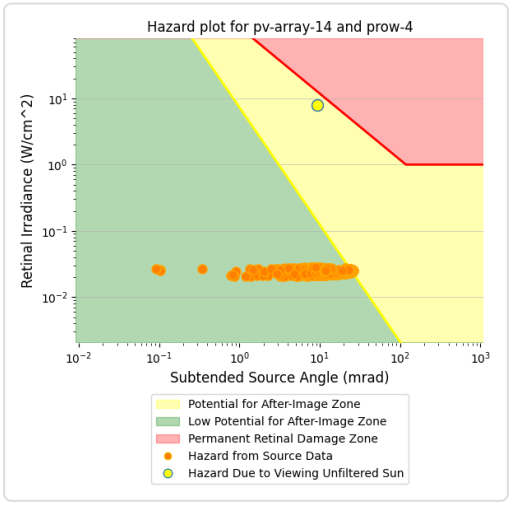
PV array 14 and Route: PRoW 4

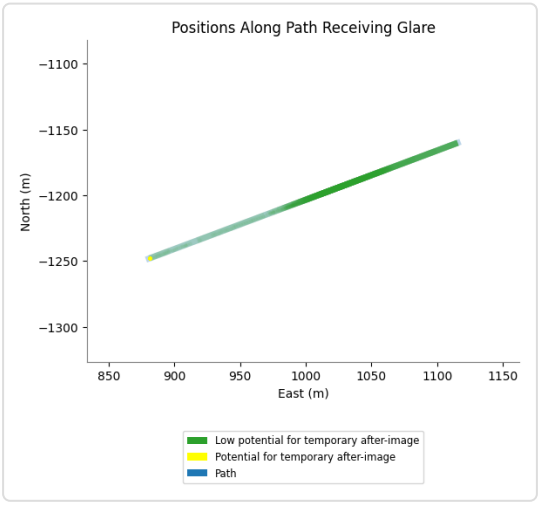
Yellow glare: 49 min.

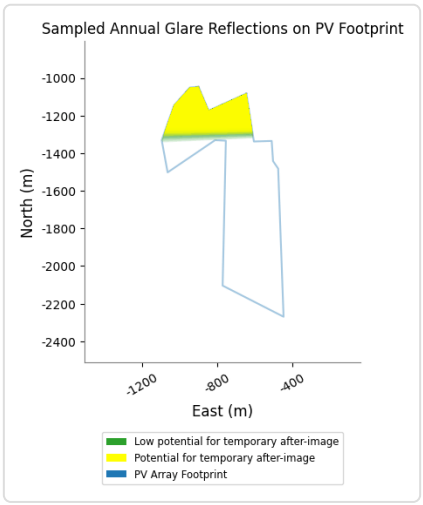
Green glare: 372 min.







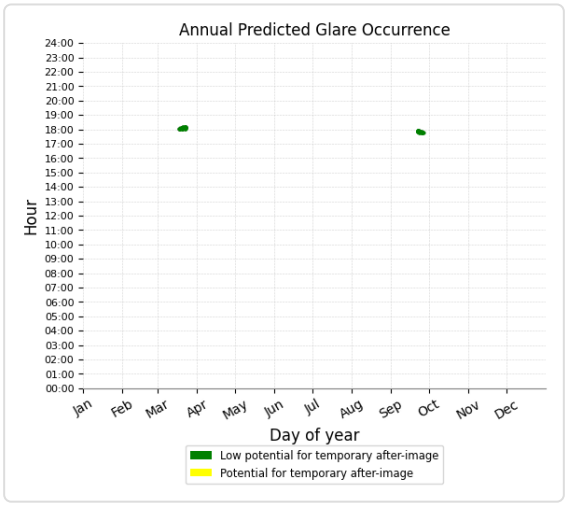


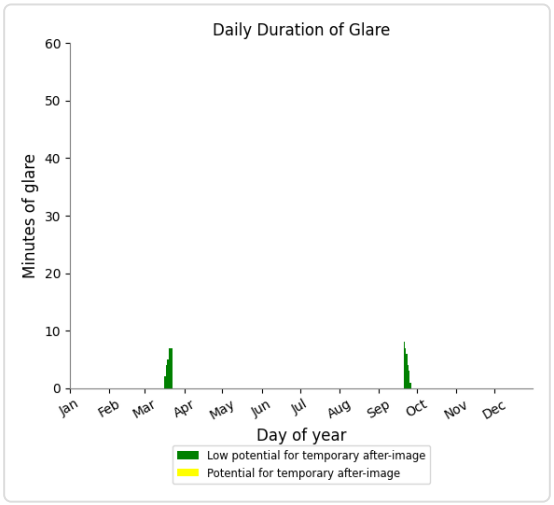


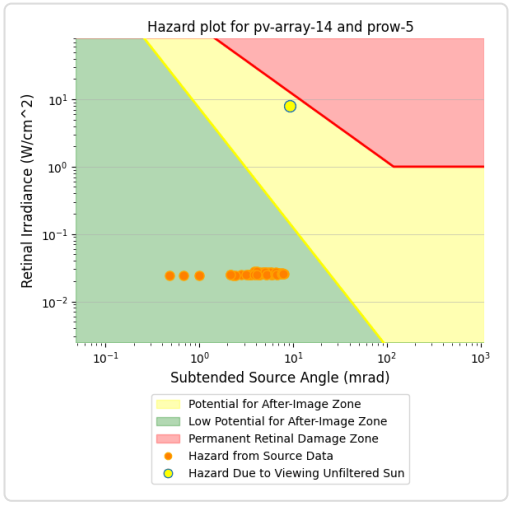
PV array 14 and Route: PRoW 5

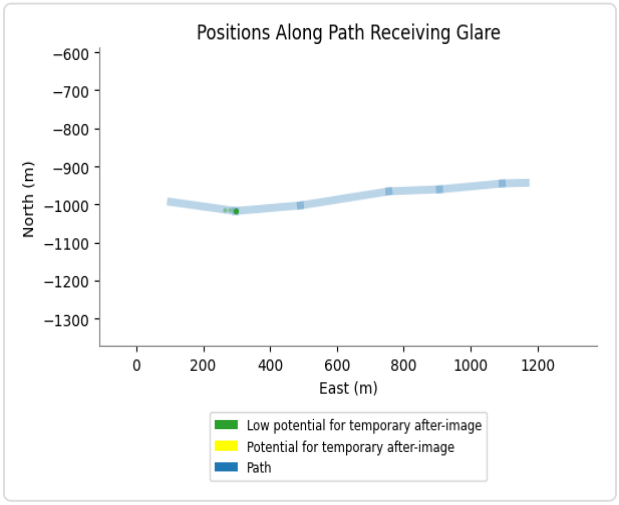
Yellow glare: none

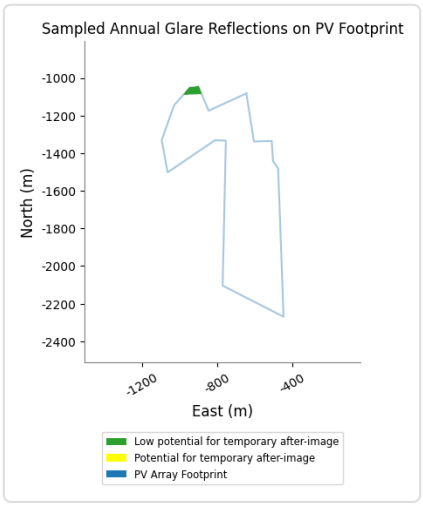
Green glare: 61 min.











PV array 14 and Route: PRoW 10

No glare found

PV: PV array 3 potential temporary after-image

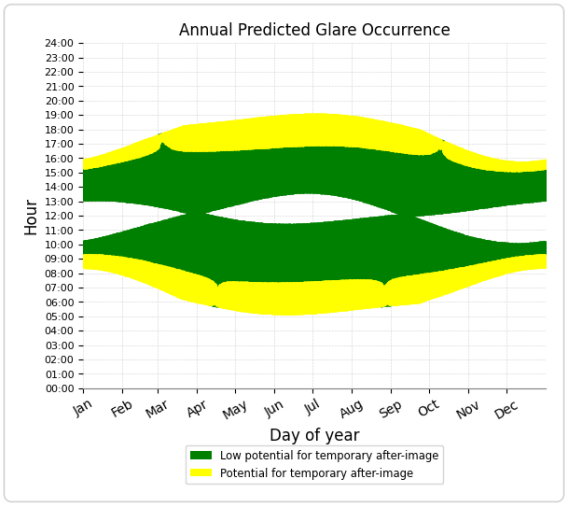
Receptor results ordered by category of glare

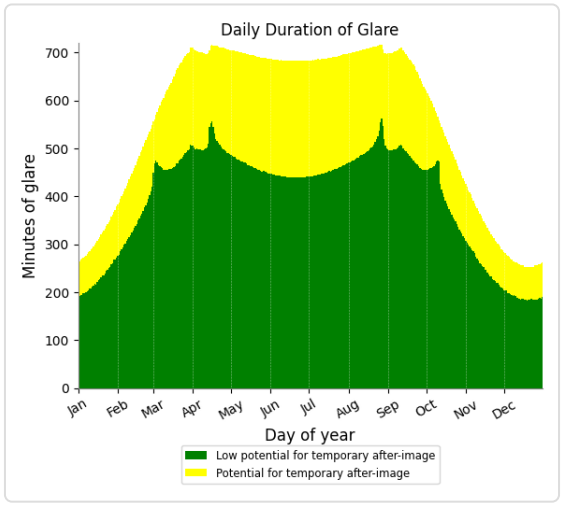
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
PRoW 1	143,916	2,398.6	60,606	1,010.1
PRoW 11	853	14.2	3,420	57.0
PRoW 2	5,714	95.2	16,779	279.6
PRoW 4	1,205	20.1	1,239	20.6
PRoW 10	0	0.0	0	0.0
PRoW 5	0	0.0	0	0.0

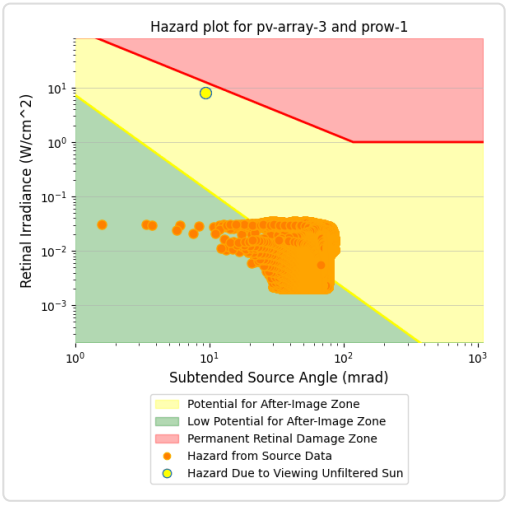
PV array 3 and Route: PRoW 1

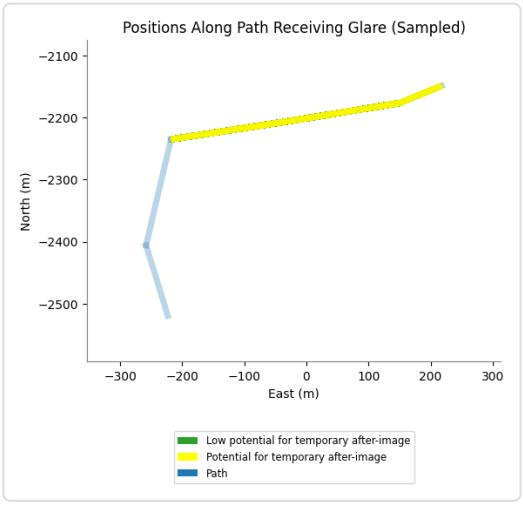
Yellow glare: 60,606 min.

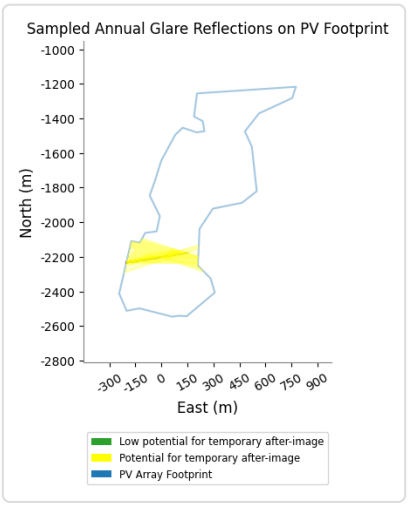
Green glare: 143,916 min.







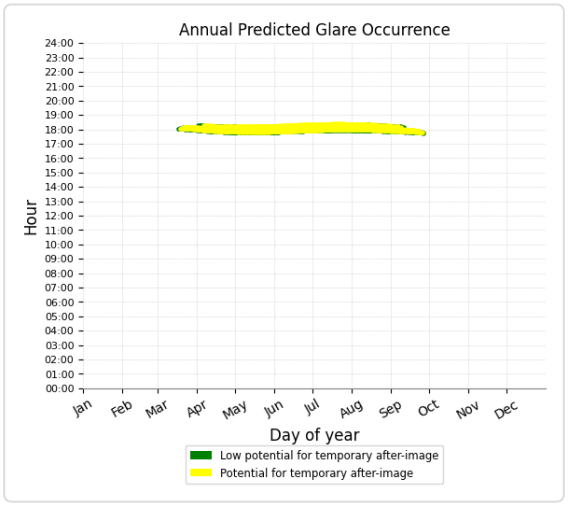


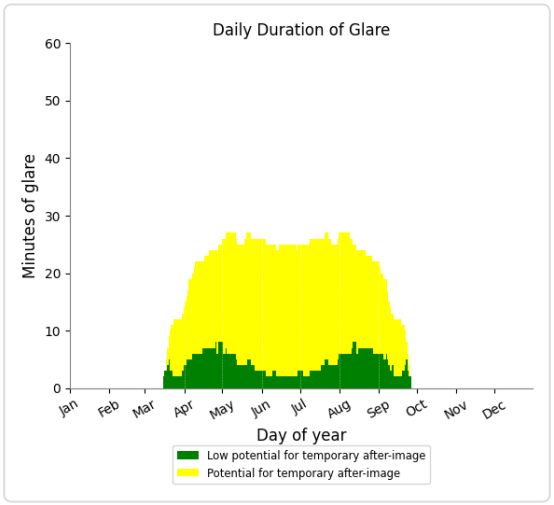


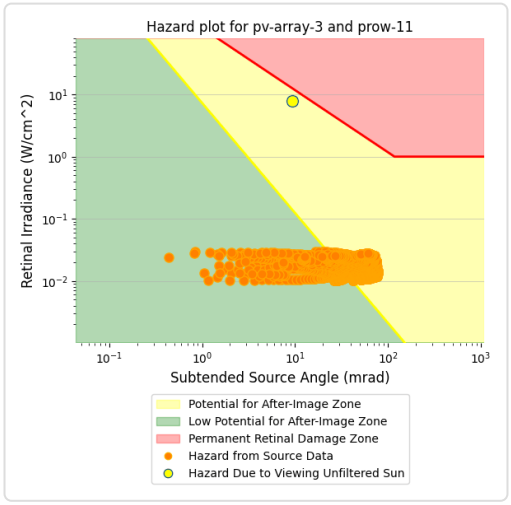
PV array 3 and Route: PRoW 11

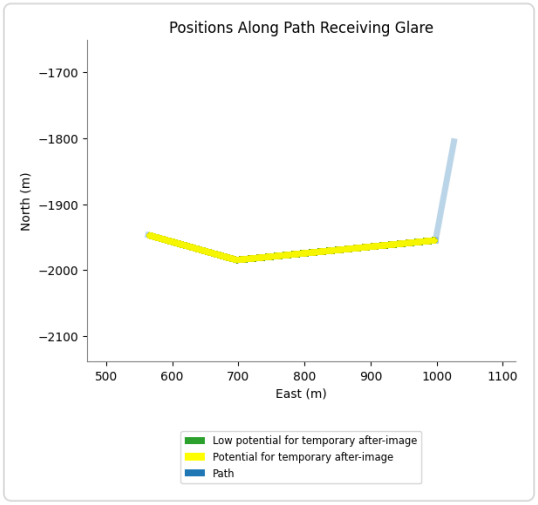
Yellow glare: 3,420 min.

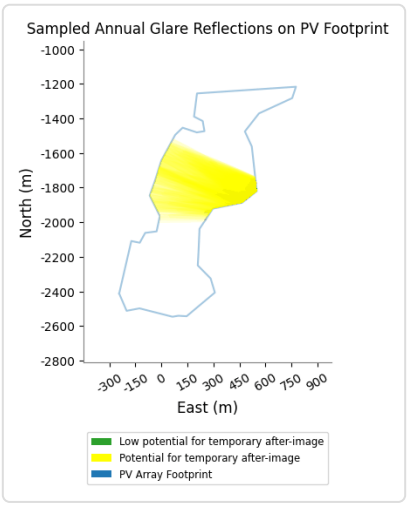
Green glare: 853 min.







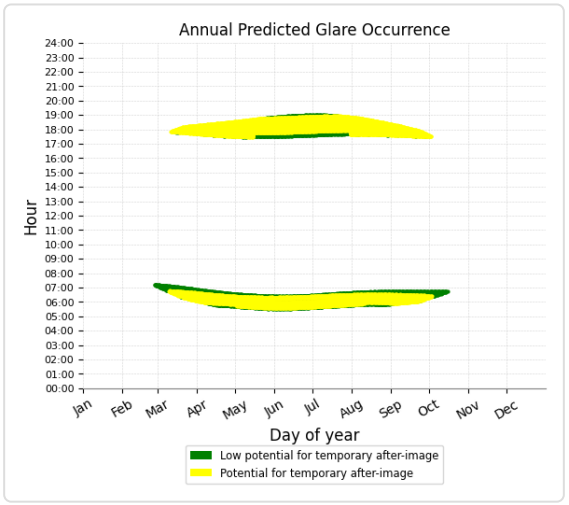


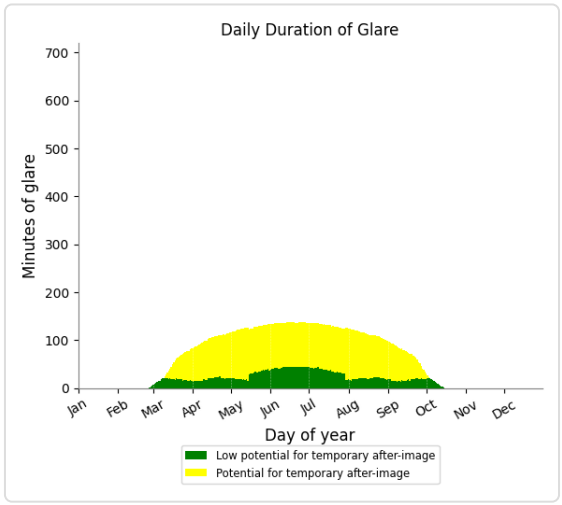


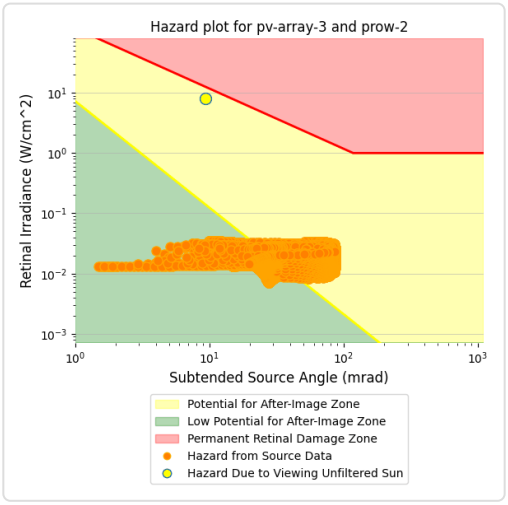
PV array 3 and Route: PRoW 2

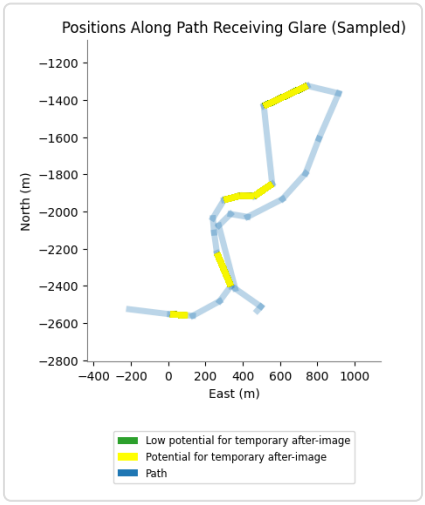
Yellow glare: 16,779 min.

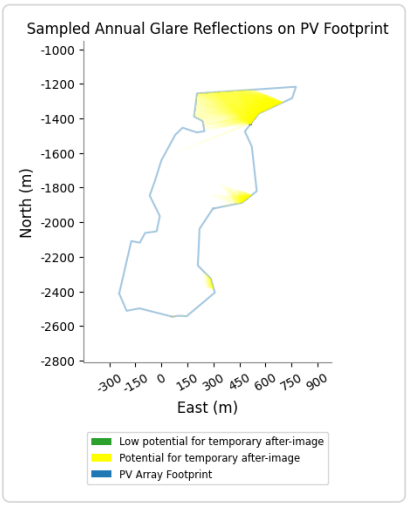
Green glare: 5,714 min.







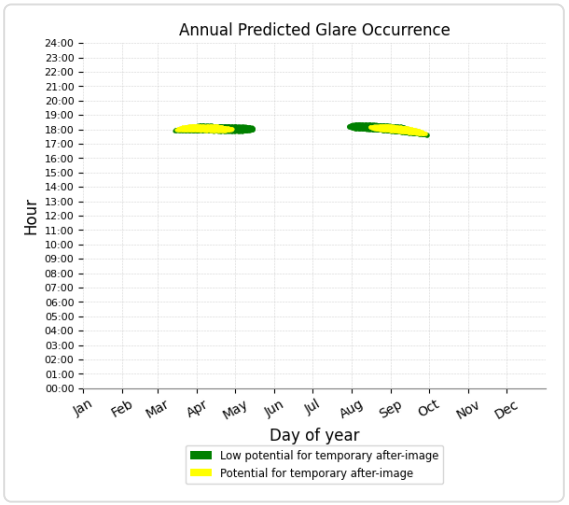


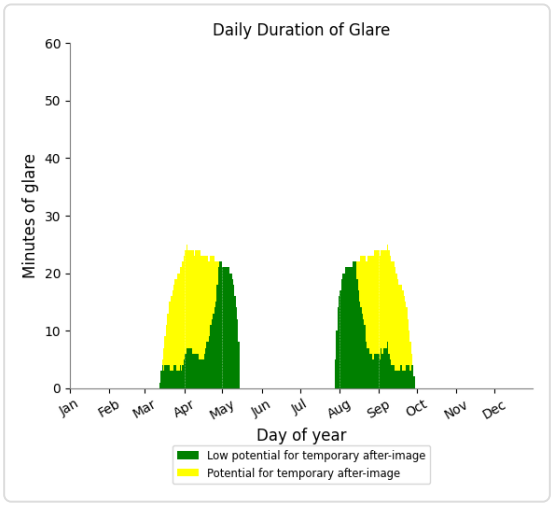


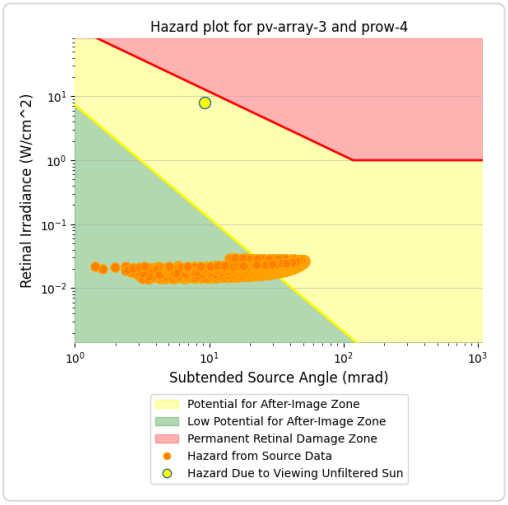
PV array 3 and Route: PRoW 4

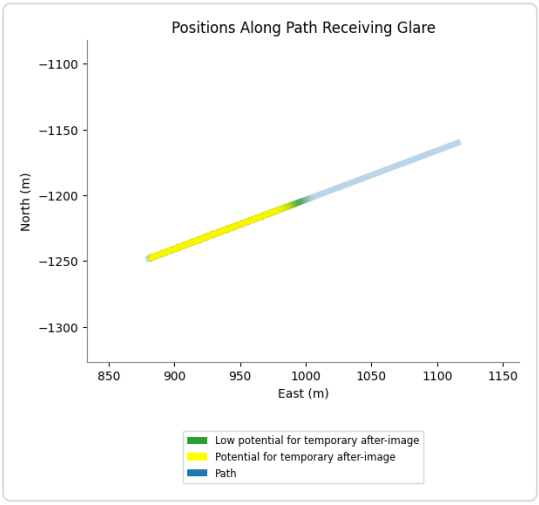
Yellow glare: 1,239 min.

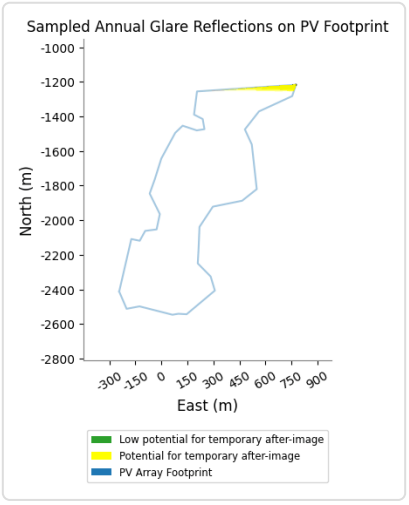
Green glare: 1,205 min.











PV array 3 and Route: PRoW 10

No glare found

PV array 3 and Route: PRoW 5

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 3**
Site configuration: **JS W3 - Aviation-temp-11**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153792.25517

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	8.0	180.0	1,208	20.1	603	10.1	-
PV array 14	8.0	180.0	693	11.6	0	0.0	-
PV array 3	8.0	180.0	700	11.7	0	0.0	-

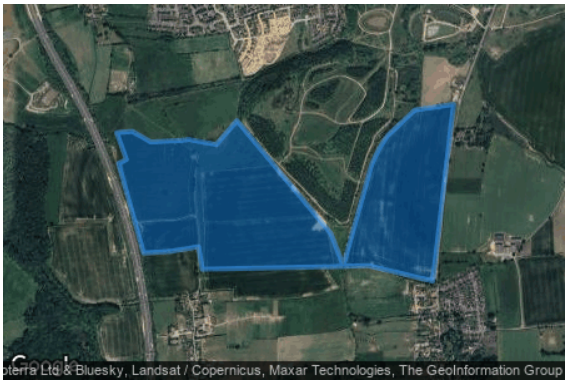
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 24	2,601	43.4	603	10.1
Runway 36	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV array 10
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332187	-1.278957	90.29	3.80	94.09
2	53.332123	-1.281038	93.39	3.80	97.19
3	53.332559	-1.282304	96.34	3.80	100.14
4	53.332507	-1.283377	99.28	3.80	103.08
5	53.331405	-1.282712	97.51	3.80	101.31
6	53.331252	-1.283248	100.06	3.80	103.86
7	53.327587	-1.281531	105.78	3.80	109.58
8	53.327651	-1.279665	115.20	3.80	119.00
9	53.327843	-1.277755	105.29	3.80	109.09
10	53.326920	-1.277497	106.91	3.80	110.71
11	53.327036	-1.267863	90.02	3.80	93.82
12	53.327074	-1.266125	91.84	3.80	95.64
13	53.326433	-1.261662	99.50	3.80	103.30
14	53.333661	-1.260224	89.56	3.80	93.36
15	53.333430	-1.262885	88.21	3.80	92.01
16	53.332367	-1.264794	90.44	3.80	94.24
17	53.331828	-1.265352	89.00	3.80	92.80
18	53.331226	-1.265846	88.66	3.80	92.46
19	53.327060	-1.267801	90.20	3.80	94.00
20	53.328381	-1.268657	89.34	3.80	93.14
21	53.332994	-1.275116	89.05	3.80	92.85
22	53.332021	-1.276532	88.05	3.80	91.85
23	53.332226	-1.278399	90.83	3.80	94.63

Name: PV array 14
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.322460	-1.288645	97.50	3.80	101.30
2	53.321639	-1.291649	102.80	3.80	106.60
3	53.322780	-1.292454	93.40	3.80	97.20
4	53.322745	-1.293141	93.60	3.80	97.40
5	53.321896	-1.294396	96.50	3.80	100.30
6	53.320230	-1.295383	104.90	3.80	108.70
7	53.318691	-1.294911	109.70	3.80	113.50
8	53.320230	-1.291134	114.20	3.80	118.00
9	53.320204	-1.290276	114.80	3.80	118.60
10	53.313282	-1.290534	137.70	3.80	141.50
11	53.311795	-1.285684	130.10	3.80	133.90
12	53.318871	-1.286113	103.90	3.80	107.70
13	53.319230	-1.286521	102.90	3.80	106.70
14	53.320191	-1.286628	99.20	3.80	103.00
15	53.320165	-1.288044	105.20	3.80	109.00

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 8.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.310510	-1.282613	128.50	3.80	132.30
2	53.309613	-1.281969	123.20	3.80	127.00
3	53.309741	-1.280853	123.40	3.80	127.20
4	53.309305	-1.277999	116.70	3.80	120.50
5	53.309357	-1.277484	116.30	3.80	120.10
6	53.309331	-1.276776	113.30	3.80	117.10
7	53.310562	-1.274330	105.20	3.80	109.00
8	53.311292	-1.274695	105.50	3.80	109.30
9	53.311972	-1.275810	107.30	3.80	111.10
10	53.312651	-1.275746	105.90	3.80	109.70
11	53.313869	-1.275660	104.40	3.80	108.20
12	53.314920	-1.274502	103.80	3.80	107.60
13	53.315228	-1.271970	105.20	3.80	109.00
14	53.315831	-1.270704	104.50	3.80	108.30
15	53.318151	-1.271133	104.70	3.80	108.50
16	53.318933	-1.271733	104.80	3.80	108.60
17	53.319868	-1.270510	101.50	3.80	105.30
18	53.320663	-1.267635	95.70	3.80	99.50
19	53.321253	-1.267313	95.10	3.80	98.90
20	53.320907	-1.275875	110.60	3.80	114.40
21	53.319702	-1.276132	113.30	3.80	117.10
22	53.319471	-1.275381	114.10	3.80	117.90
23	53.318945	-1.275231	116.50	3.80	120.30
24	53.318881	-1.275896	119.00	3.80	122.80
25	53.319125	-1.277119	114.60	3.80	118.40
26	53.318753	-1.277763	113.90	3.80	117.70
27	53.317420	-1.278965	117.70	3.80	121.50
28	53.316356	-1.279523	117.50	3.80	121.30
29	53.315600	-1.279973	121.80	3.80	125.60
30	53.314536	-1.279093	119.30	3.80	123.10
31	53.313738	-1.279373	121.00	3.80	124.80
32	53.313662	-1.280360	125.70	3.80	129.50
33	53.313149	-1.280833	128.20	3.80	132.00
34	53.313238	-1.281562	128.30	3.80	132.10

Flight Path Receptors

Name: Runway 06
Description:
Threshold height: 15 m
Direction: 55.4°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.315826	-1.198952	78.02	15.24	93.26
Two-mile	53.299408	-1.238836	128.83	133.11	261.94

Name: Runway 18
Description:
Threshold height: 15 m
Direction: 174.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.318362	-1.195780	70.76	15.24	86.00
Two-mile	53.347156	-1.200172	107.06	147.62	254.68

Name: Runway 24
Description:
Threshold height: 15 m
Direction: 235.5°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.317698	-1.194392	69.74	15.24	84.98
Two-mile	53.334078	-1.154463	61.81	191.86	253.67

Name: Runway 36
Description:
Threshold height: 15 m
Direction: 354.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.315754	-1.195395	73.22	15.24	88.46
Two-mile	53.286960	-1.191004	80.28	176.86	257.14

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	8.0	180.0	1,208	20.1	603	10.1	-
PV array 14	8.0	180.0	693	11.6	0	0.0	-
PV array 3	8.0	180.0	700	11.7	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 24	2,601	43.4	603	10.1
Runway 36	0	0.0	0	0.0

PV: PV array 10

potential temporary after-image

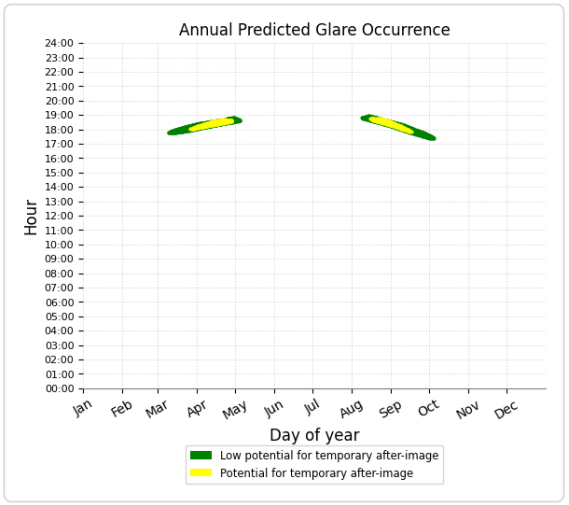
Receptor results ordered by category of glare

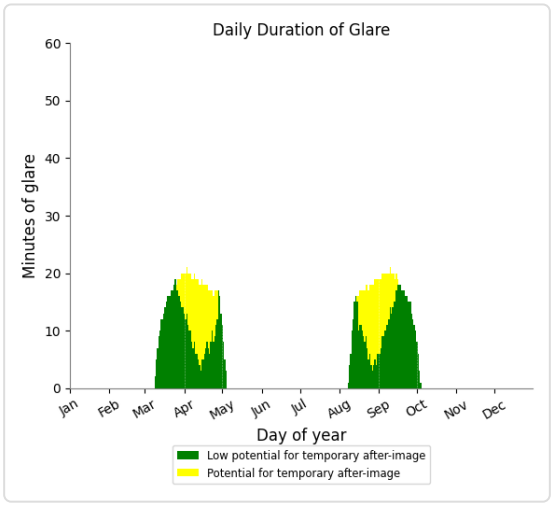
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 24	1,208	20.1	603	10.1
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 36	0	0.0	0	0.0

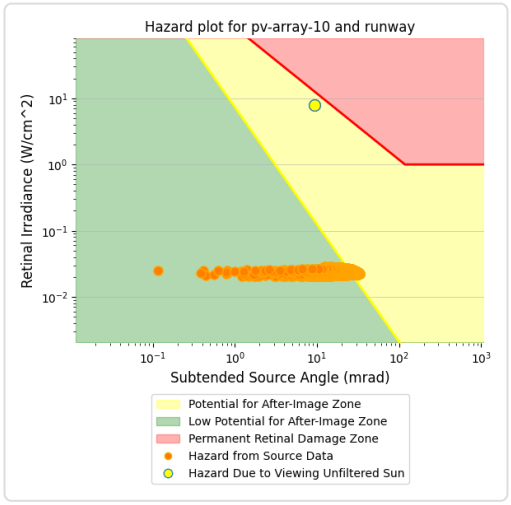
PV array 10 and FP: Runway 24

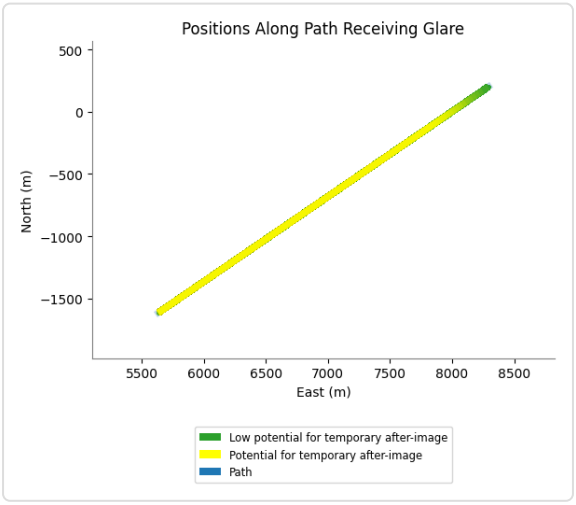
Yellow glare: 603 min.

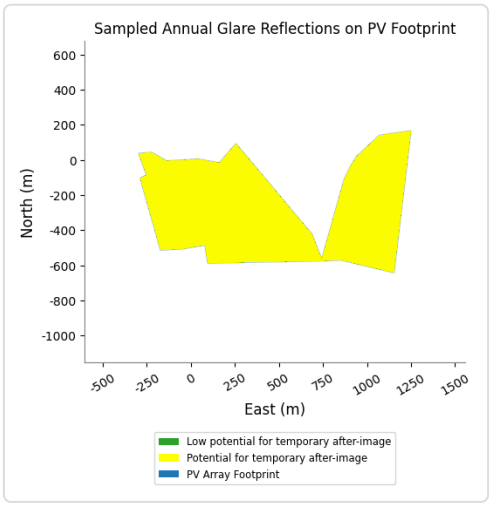
Green glare: 1,208 min.

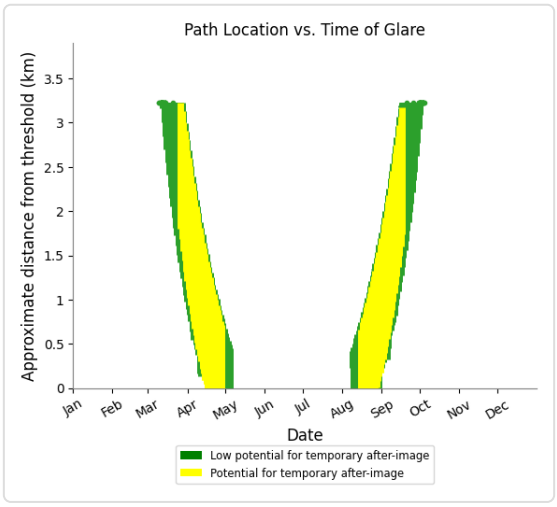












PV array 10 and FP: Runway 06

No glare found

PV array 10 and FP: Runway 18

No glare found

PV array 10 and FP: Runway 36

No glare found

PV: PV array 14 low potential for temporary after-image

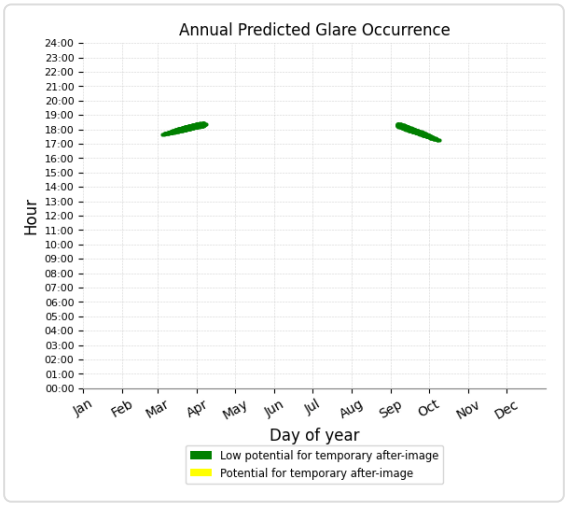
Receptor results ordered by category of glare

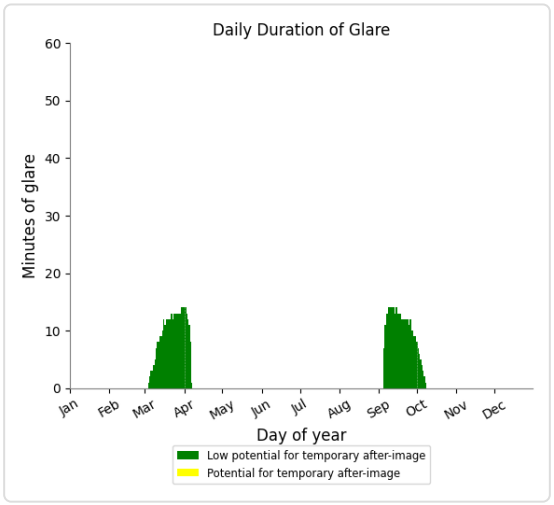
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 24	693	11.6	0	0.0
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 36	0	0.0	0	0.0

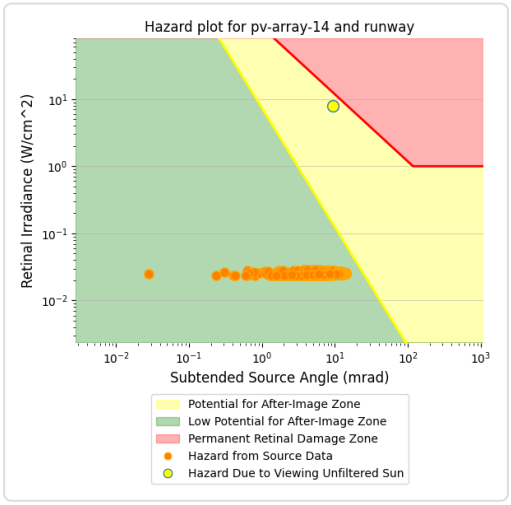
PV array 14 and FP: Runway 24

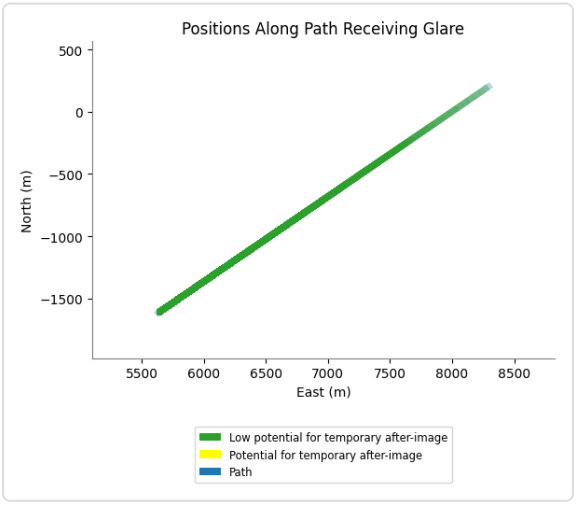
Yellow glare: none

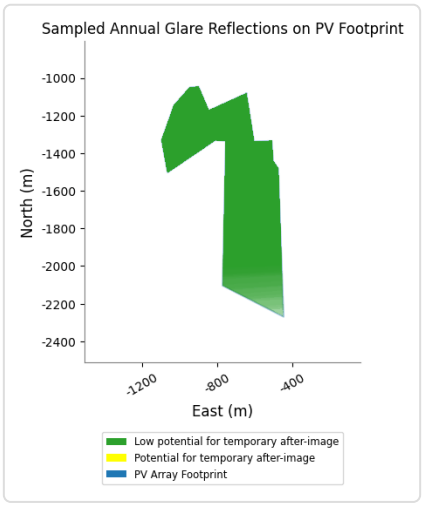
Green glare: 693 min.

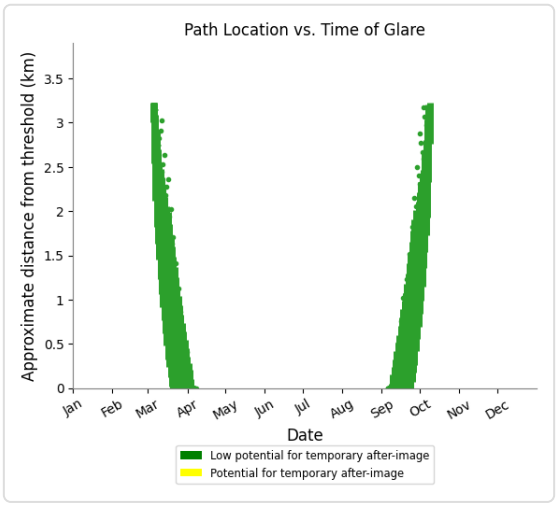












PV array 14 and FP: Runway 06

No glare found

PV array 14 and FP: Runway 18

No glare found

PV array 14 and FP: Runway 36

No glare found

PV: PV array 3 low potential for temporary after-image

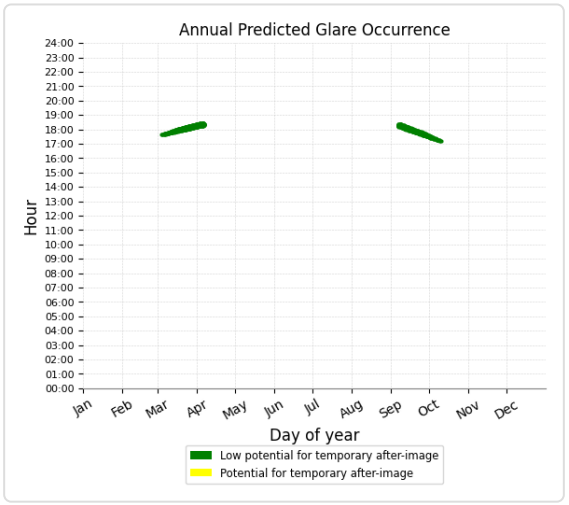
Receptor results ordered by category of glare

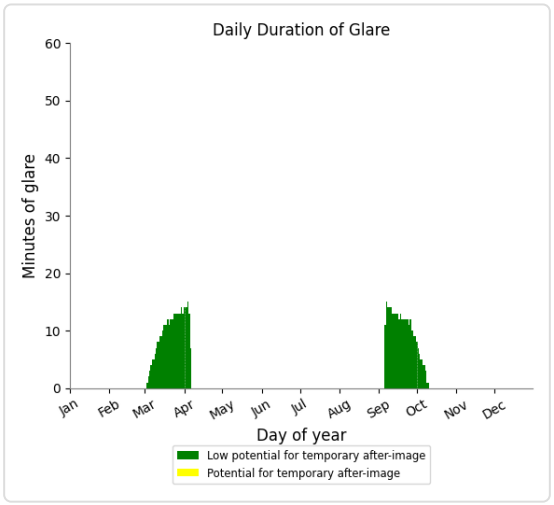
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 24	700	11.7	0	0.0
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 36	0	0.0	0	0.0

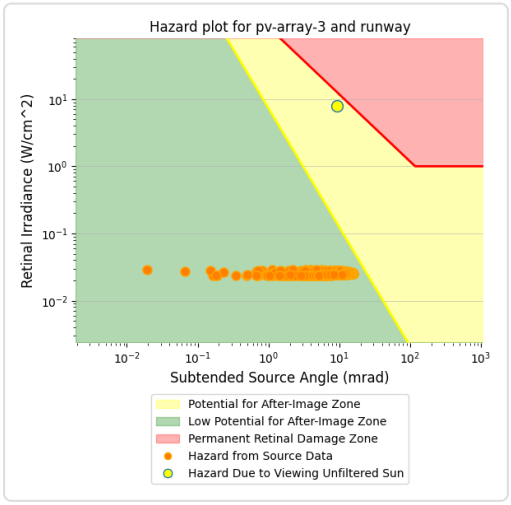
PV array 3 and FP: Runway 24

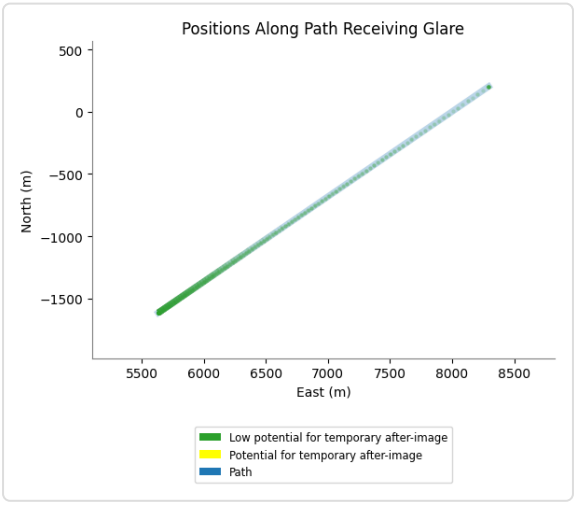
Yellow glare: none

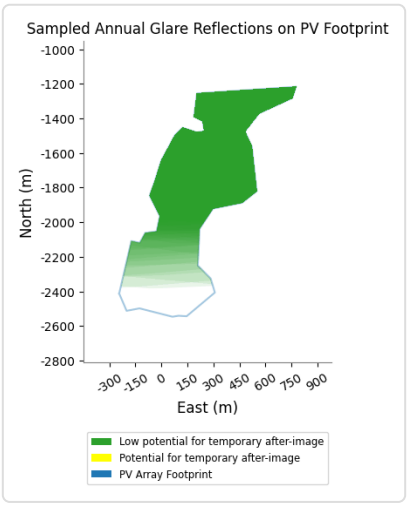
Green glare: 700 min.

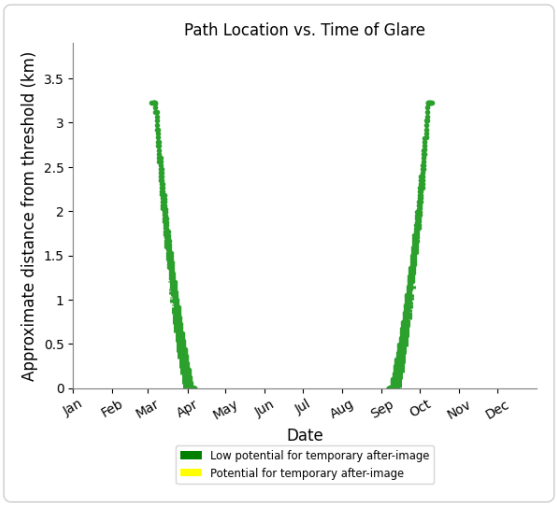












PV array 3 and FP: Runway 06

No glare found

PV array 3 and FP: Runway 18

No glare found

PV array 3 and FP: Runway 36

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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FORGESOLAR GLARE ANALYSIS

Project: **Whitestone 3**
Site configuration: **JS W3 - Aviation**

Created 02 Jul, 2025
Updated 02 Jul, 2025
Time-step 1 minute
Timezone offset UTC0
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category >1 GW
Site ID 153789.25517

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2



Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	25.0	180.0	686	11.4	925	15.4	-
PV array 14	25.0	180.0	376	6.3	0	0.0	-
PV array 3	25.0	180.0	541	9.0	0	0.0	-

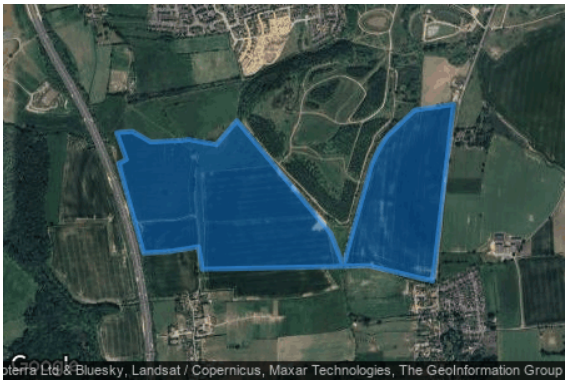
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 24	1,603	26.7	925	15.4
Runway 36	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV array 10
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.332187	-1.278957	90.29	3.80	94.09
2	53.332123	-1.281038	93.39	3.80	97.19
3	53.332559	-1.282304	96.34	3.80	100.14
4	53.332507	-1.283377	99.28	3.80	103.08
5	53.331405	-1.282712	97.51	3.80	101.31
6	53.331252	-1.283248	100.06	3.80	103.86
7	53.327587	-1.281531	105.78	3.80	109.58
8	53.327651	-1.279665	115.20	3.80	119.00
9	53.327843	-1.277755	105.29	3.80	109.09
10	53.326920	-1.277497	106.91	3.80	110.71
11	53.327036	-1.267863	90.02	3.80	93.82
12	53.327074	-1.266125	91.84	3.80	95.64
13	53.326433	-1.261662	99.50	3.80	103.30
14	53.333661	-1.260224	89.56	3.80	93.36
15	53.333430	-1.262885	88.21	3.80	92.01
16	53.332367	-1.264794	90.44	3.80	94.24
17	53.331828	-1.265352	89.00	3.80	92.80
18	53.331226	-1.265846	88.66	3.80	92.46
19	53.327060	-1.267801	90.20	3.80	94.00
20	53.328381	-1.268657	89.34	3.80	93.14
21	53.332994	-1.275116	89.05	3.80	92.85
22	53.332021	-1.276532	88.05	3.80	91.85
23	53.332226	-1.278399	90.83	3.80	94.63

Name: PV array 14
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.322460	-1.288645	97.50	3.80	101.30
2	53.321639	-1.291649	102.80	3.80	106.60
3	53.322780	-1.292454	93.40	3.80	97.20
4	53.322745	-1.293141	93.60	3.80	97.40
5	53.321896	-1.294396	96.50	3.80	100.30
6	53.320230	-1.295383	104.90	3.80	108.70
7	53.318691	-1.294911	109.70	3.80	113.50
8	53.320230	-1.291134	114.20	3.80	118.00
9	53.320204	-1.290276	114.80	3.80	118.60
10	53.313282	-1.290534	137.70	3.80	141.50
11	53.311795	-1.285684	130.10	3.80	133.90
12	53.318871	-1.286113	103.90	3.80	107.70
13	53.319230	-1.286521	102.90	3.80	106.70
14	53.320191	-1.286628	99.20	3.80	103.00
15	53.320165	-1.288044	105.20	3.80	109.00

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.310510	-1.282613	128.50	3.80	132.30
2	53.309613	-1.281969	123.20	3.80	127.00
3	53.309741	-1.280853	123.40	3.80	127.20
4	53.309305	-1.277999	116.70	3.80	120.50
5	53.309357	-1.277484	116.30	3.80	120.10
6	53.309331	-1.276776	113.30	3.80	117.10
7	53.310562	-1.274330	105.20	3.80	109.00
8	53.311292	-1.274695	105.50	3.80	109.30
9	53.311972	-1.275810	107.30	3.80	111.10
10	53.312651	-1.275746	105.90	3.80	109.70
11	53.313869	-1.275660	104.40	3.80	108.20
12	53.314920	-1.274502	103.80	3.80	107.60
13	53.315228	-1.271970	105.20	3.80	109.00
14	53.315831	-1.270704	104.50	3.80	108.30
15	53.318151	-1.271133	104.70	3.80	108.50
16	53.318933	-1.271733	104.80	3.80	108.60
17	53.319868	-1.270510	101.50	3.80	105.30
18	53.320663	-1.267635	95.70	3.80	99.50
19	53.321253	-1.267313	95.10	3.80	98.90
20	53.320907	-1.275875	110.60	3.80	114.40
21	53.319702	-1.276132	113.30	3.80	117.10
22	53.319471	-1.275381	114.10	3.80	117.90
23	53.318945	-1.275231	116.50	3.80	120.30
24	53.318881	-1.275896	119.00	3.80	122.80
25	53.319125	-1.277119	114.60	3.80	118.40
26	53.318753	-1.277763	113.90	3.80	117.70
27	53.317420	-1.278965	117.70	3.80	121.50
28	53.316356	-1.279523	117.50	3.80	121.30
29	53.315600	-1.279973	121.80	3.80	125.60
30	53.314536	-1.279093	119.30	3.80	123.10
31	53.313738	-1.279373	121.00	3.80	124.80
32	53.313662	-1.280360	125.70	3.80	129.50
33	53.313149	-1.280833	128.20	3.80	132.00
34	53.313238	-1.281562	128.30	3.80	132.10

Flight Path Receptors

Name: Runway 06
Description:
Threshold height: 15 m
Direction: 55.4°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.315826	-1.198952	78.02	15.24	93.26
Two-mile	53.299408	-1.238836	128.83	133.11	261.94

Name: Runway 18
Description:
Threshold height: 15 m
Direction: 174.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.318362	-1.195780	70.76	15.24	86.00
Two-mile	53.347156	-1.200172	107.06	147.62	254.68

Name: Runway 24
Description:
Threshold height: 15 m
Direction: 235.5°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.317698	-1.194392	69.74	15.24	84.98
Two-mile	53.334078	-1.154463	61.81	191.86	253.67

Name: Runway 36
Description:
Threshold height: 15 m
Direction: 354.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.315754	-1.195395	73.22	15.24	88.46
Two-mile	53.286960	-1.191004	80.28	176.86	257.14

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 10	25.0	180.0	686	11.4	925	15.4	-
PV array 14	25.0	180.0	376	6.3	0	0.0	-
PV array 3	25.0	180.0	541	9.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 24	1,603	26.7	925	15.4
Runway 36	0	0.0	0	0.0

PV: PV array 10

potential temporary after-image

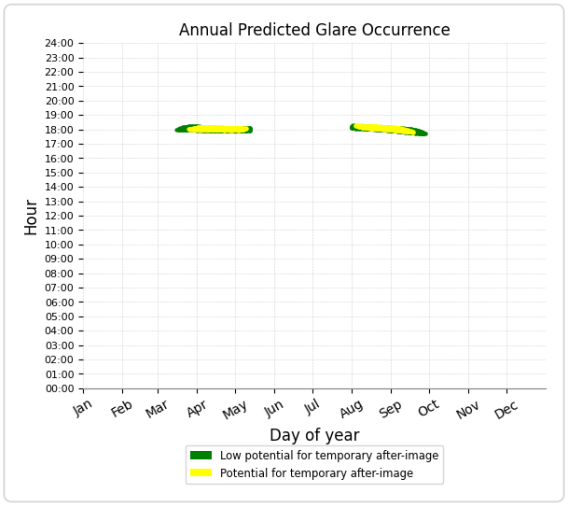
Receptor results ordered by category of glare

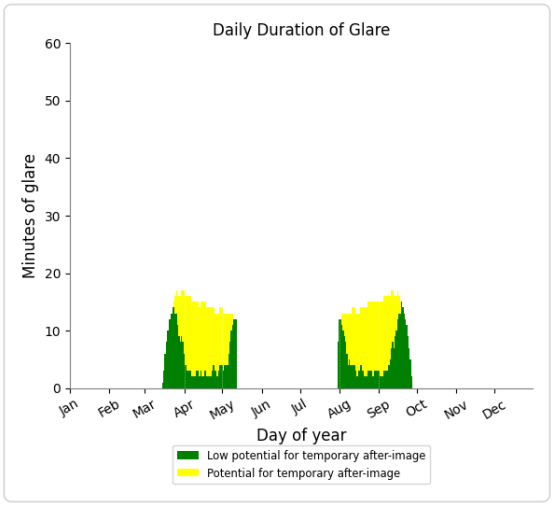
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 24	686	11.4	925	15.4
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 36	0	0.0	0	0.0

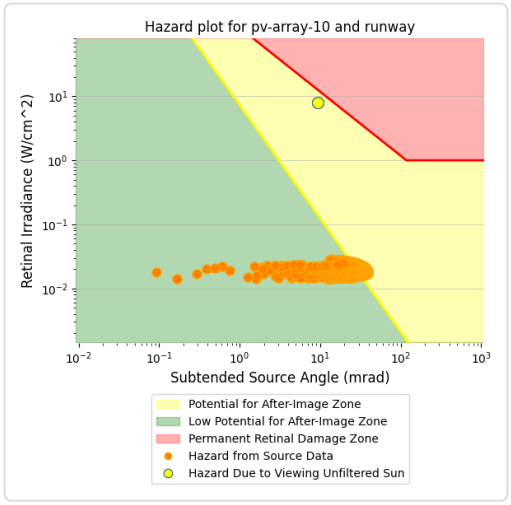
PV array 10 and FP: Runway 24

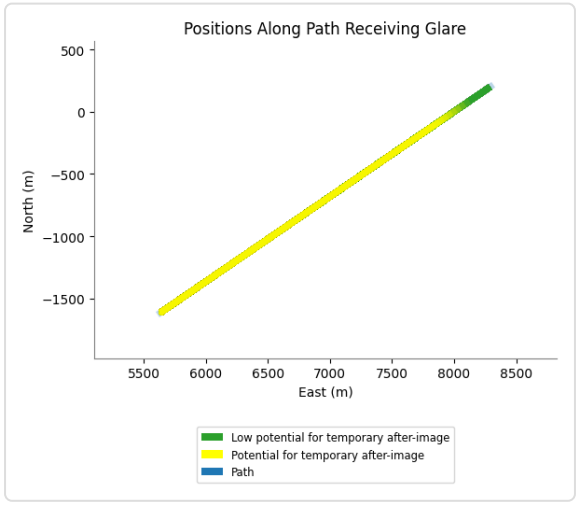
Yellow glare: 925 min.

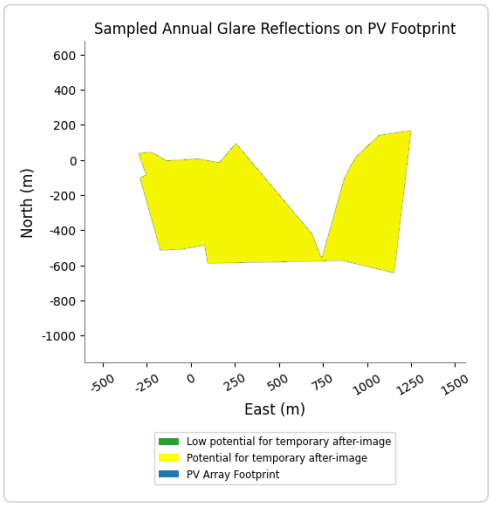
Green glare: 686 min.

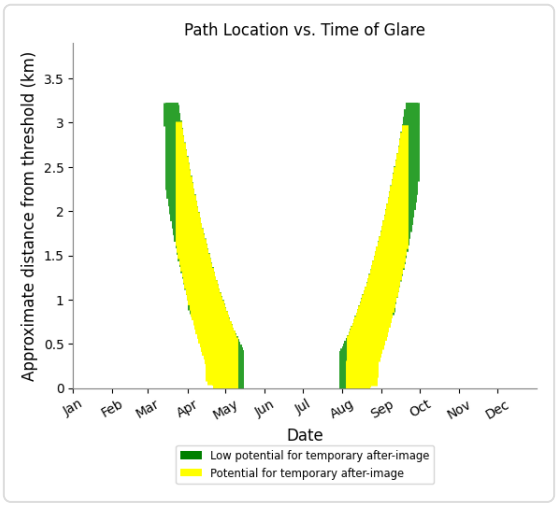












PV array 10 and FP: Runway 06

No glare found

PV array 10 and FP: Runway 18

No glare found

PV array 10 and FP: Runway 36

No glare found

PV: PV array 14 low potential for temporary after-image

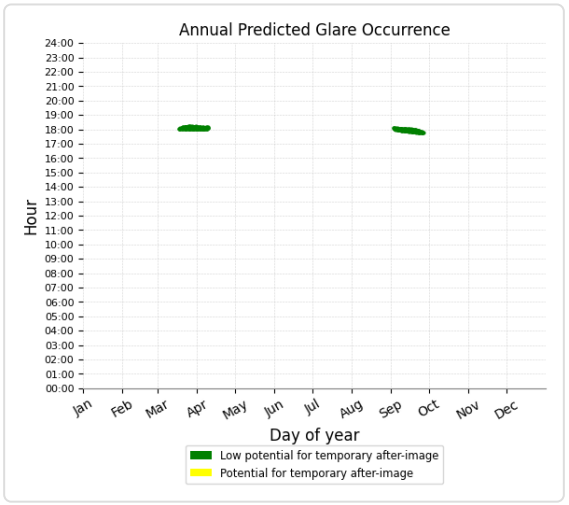
Receptor results ordered by category of glare

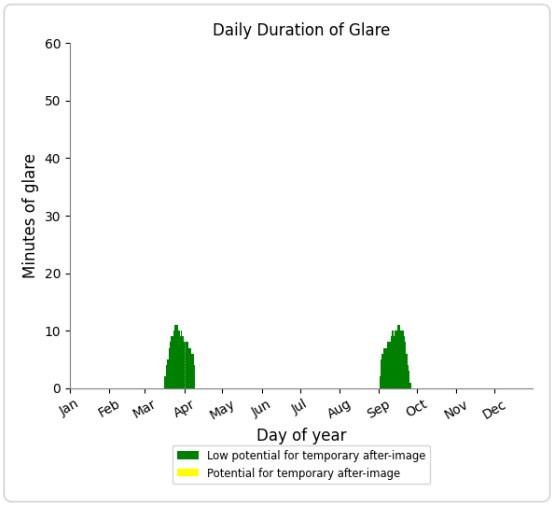
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 24	376	6.3	0	0.0
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 36	0	0.0	0	0.0

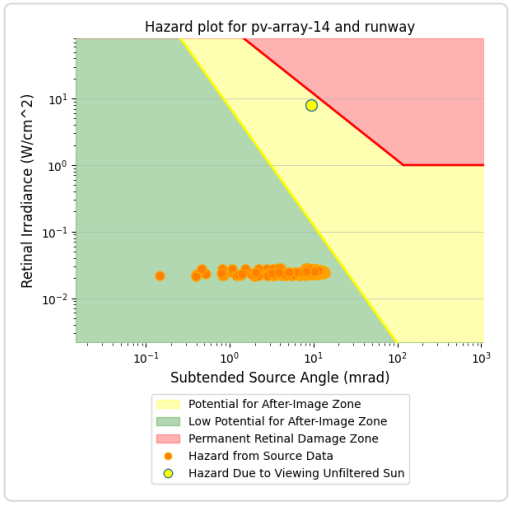
PV array 14 and FP: Runway 24

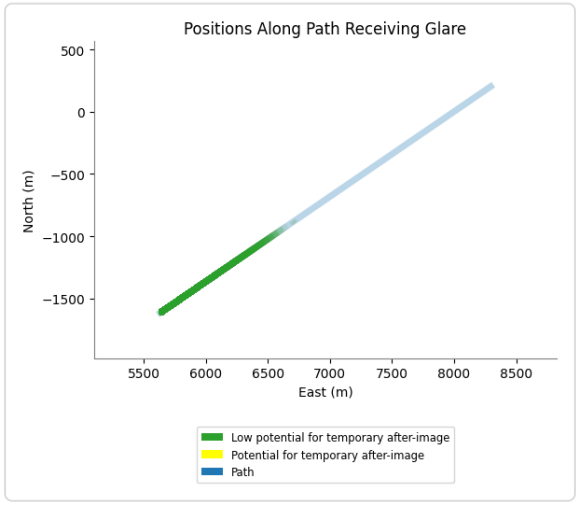
Yellow glare: none

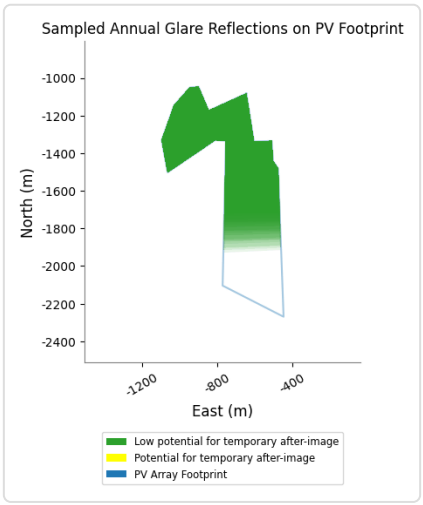
Green glare: 376 min.

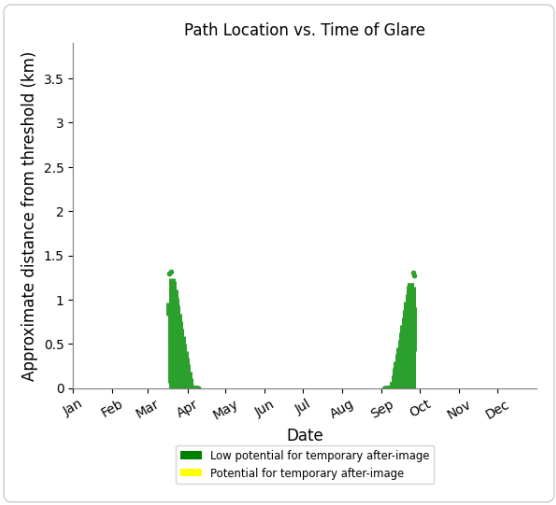












PV array 14 and FP: Runway 06

No glare found

PV array 14 and FP: Runway 18

No glare found

PV array 14 and FP: Runway 36

No glare found

PV: PV array 3 low potential for temporary after-image

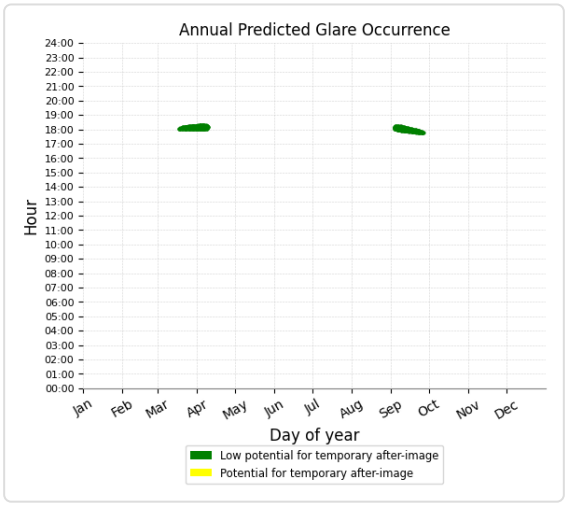
Receptor results ordered by category of glare

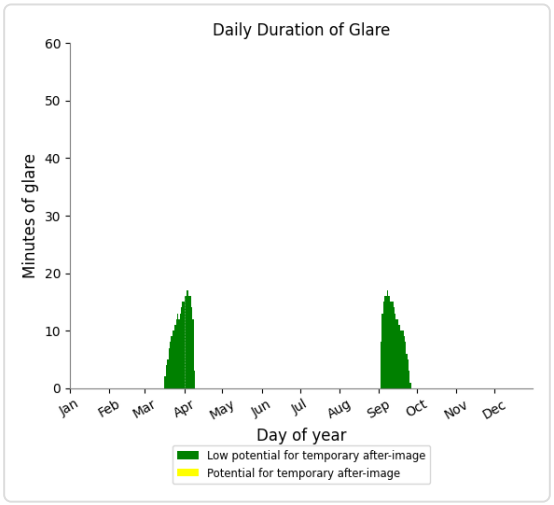
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Runway 24	541	9.0	0	0.0
Runway 06	0	0.0	0	0.0
Runway 18	0	0.0	0	0.0
Runway 36	0	0.0	0	0.0

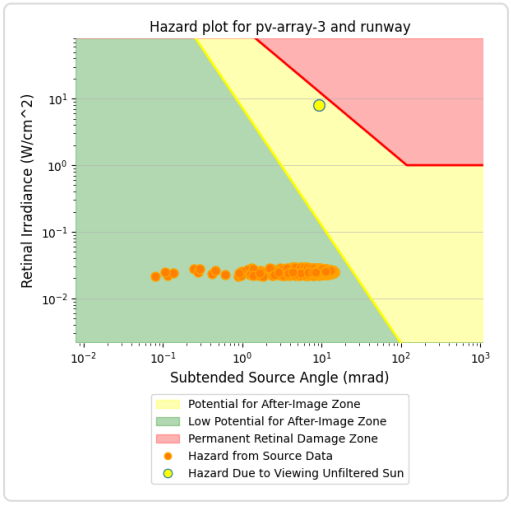
PV array 3 and FP: Runway 24

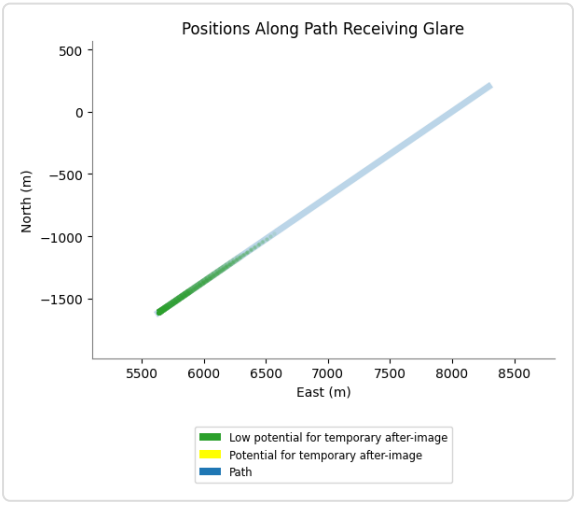
Yellow glare: none

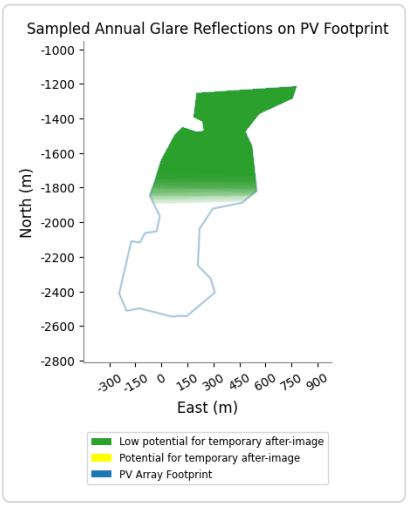
Green glare: 541 min.

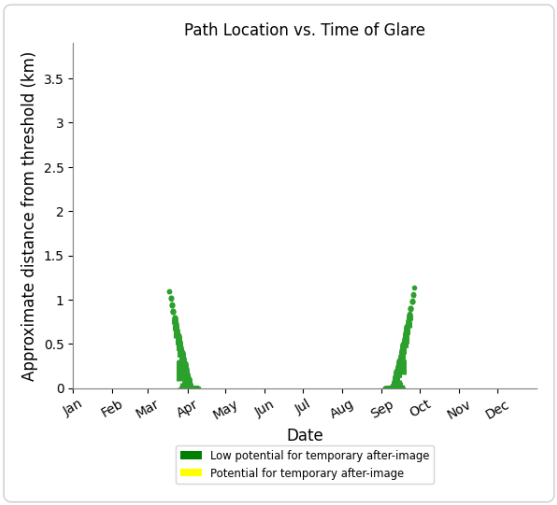












PV array 3 and FP: Runway 06

No glare found

PV array 3 and FP: Runway 18

No glare found

PV array 3 and FP: Runway 36

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at [redacted] assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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Annex B – Pager Power Analysis - Roads and Residential Receptors

PAGERPOWER

Glint and Glare Impact Assessment

ERM Limited

Whitestones Solar

April 2026



www.pagerpower.com

ADMINISTRATION PAGE

Job Reference:	15442A2
Author:	[redacted]
Email:	[redacted]
Telephone:	[redacted]

Reviewed By:	[redacted]
Email:	[redacted]

Issue	Date	Detail of Changes
1	13 January 2026	Initial issue
2	25 March 2026	Assessment of additional receptors
3	02 April 2026	Update of receptor labelling

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GEOMETRIC ASSESSMENT RESULTS AND DISCUSSION

Introduction

This document presents Pager Power's assessment of the predicted impact significance towards each receptor geometrically modelled as part of 15441A1.

Detailed modelling outputs are presented within 15441A1.

Overview

The following subsections present the significance of any predicted impact in the context of existing screening and the relevant criteria set out in each sub-section. The criteria are determined by the assessment process for each receptor, which are set out in the report appendix.

When determining the visibility of the reflecting panels for an observer, a conservative review of the available imagery has been undertaken, whereby it is assumed views of the panels are possible if it cannot be reliably determined that existing screening will remove effects.

Within this report, receptors are labelled in accordance with ERM's internally modelling. Pager Power's receptor labels are presented in brackets below this.

The modelling scenario, based upon the panel tilt angle, are also presented for each result in the tables in the following sections.

Assessment results – Road Receptors

Key Considerations

The process for quantifying impact significance is defined in the report appendix. The key considerations for road users along major national, national, and regional roads are:

- Whether a reflection is predicted to be experienced in practice;
- The location of the reflecting panel relative to a road user's direction of travel.

Where no solar reflections are geometrically possible or where solar reflections are predicted to be significantly screened, no impact is predicted, and mitigation is not required.

Where reflections originate from outside of a road user's primary field of view (50 degrees either side of the direction of travel), or where the separation distance to the nearest visible reflecting panel is over 1km, the impact significance is low, and mitigation is not recommended.

Where reflections are predicted to be experienced from inside of a road user's main field of view, expert assessment of the following factors is required to determine the impact significance:

- Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers (such as HGVs) along dual carriageways and motorways compared to other types of road;

- Whether a solar reflection is fleeting in nature. Small gap/s in screening (e.g., an access point to the site) may not result in a sustained reflection for a road user;
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not;
- Whether the solar reflection originates from directly in front of a road user – a solar reflection that is directly in front of a road user is more hazardous than a solar reflection to one side.

Following consideration of these relevant factors, where the solar reflection is not deemed significant, a low impact is predicted, and mitigation is not recommended. Where the solar reflection is deemed significant, the impact significance is moderate, and mitigation is recommended.

Where reflections originate from directly in front of a road user and there are no mitigating factors, the impact significance is high, and mitigation is required.

Geometric Modelling Results

Tables 1 to 5 on the following pages present for each road:

- Geometric modelling results (prior to consideration of screening);
- Desk-based review of identified screening;
- Consideration of mitigating factors present, where appropriate;
- Predicted impact significance.

Reference is made to a road user's primary field-of-view (FOV), which is defined as 50 degrees either side of the direction of travel.

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 1 - M18 (A1 – A2) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Fleeting views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Views are fleeting through short gaps in screening Reflections mostly coincide with direct sunlight Visible reflections originate over 35° from the direction of travel Reflections originate over 550m from the receptor	Low impact
Route 1 - M18 (A3 – A4) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Reflections mostly coincide with direct sunlight Reflections originate over 680m from the receptor	**Moderate impact**

[1] Assessment scenario may include an initial conservative qualitative consideration of screening. The reflecting area of the solar development may be partially screened such that it does not meet the key criteria i.e. whether the solar reflection occurs within a road users' main field of view.

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 1 - M18 (A5 – A6) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Fleeting views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Views are fleeting through short gaps in screening Reflections mostly coincide with direct sunlight Visible reflections originate over 30° from the direction of travel Reflections originate over 750m from the receptor	Low impact
Route 1 - M18 (A7) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Reflections mostly coincide with direct sunlight Reflections originate over 700m from the receptor	**Moderate impact**

Table 1 *Geometric modelling results - road receptors (A)*

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2B - A618 (B1 – B2) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels. Residual views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Reflections partially coincide with direct sunlight	**Moderate impact**
Route 2B - A618 (B3) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels. Views of reflecting panels are not predicted in practice	N/A	N/A	No impact
Route 2B - A618 (B4) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels. Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact
Route 2B - A618 (B5) (8°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels. Views of reflecting panels are not predicted in practice	N/A	N/A	No impact

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2B - A618 (B5) (25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels. Views of reflecting panels are not predicted in practice	N/A	N/A	No impact
Route 2B - A618 (B6) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels. Views of reflecting panels are not predicted in practice	N/A	N/A	No impact
Route 2B - A618 (B7) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels. Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2B - A618 (B8) (8°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels. Views of reflecting panels are not predicted in practice	N/A	N/A	No impact
Route 2B - A618 (B8) (25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels. Views of reflecting panels are not predicted in practice	N/A	N/A	No impact
Route 2B - A618 (B9) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels. Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2B - A618 (B10) (8°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Reflections mostly coincide with direct sunlight Reflections originate over 40° from the direction of travel Reflections originate over 550m from the receptor	Low impact
Route 2B - A618 (B10) (25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact
Route 2B - A618 (B11) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2B - A618 (B12) (8°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Reflections mostly coincide with direct sunlight Reflections originate over 40° from the direction of travel Reflections originate over 900m from the receptor	Low impact
Route 2B - A618 (B12) (25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact
Route 2B - A618 (B13) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact

Table 2 *Geometric modelling results - road receptors (B)*

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 1E - A57 (C1 – C8) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	None identified	Reflections occur **inside** a road user's primary FOV and occur directly in front of a road user	Reflections partially coincide with direct sunlight	**Moderate impact**
Route 1E - A57 (C9 – C17) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	None identified	Reflections occur **inside** a road user's primary FOV but not directly in front	Reflections partially coincide with direct sunlight	**Moderate impact**
Route 1E - A57 (C18 – C19) (8° & 25°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	None identified	Reflections occur **inside** a road user's primary FOV and occur directly in front of a road user	Reflections partially coincide with direct sunlight	**Moderate impact**

Table 3 *Geometric modelling results - road receptors (C)*

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2 - M1 (D1) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact
Route 2 - M1 (D2 – D4) (8°)	Solar reflections **are** geometrically possible and occur **inside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **inside** a road user's primary FOV but not directly in front	Reflections partially coincide with direct sunlight	**Moderate impact**
Route 2 - M1 (D2 – D4) (25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact
Route 2 - M1 (D5) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact

Table 4 *Geometric modelling results - road receptors (D)*

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2D - M18 (E1 – E2) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels Views are not predicted in practice	N/A	N/A	No impact
Route 2D - M18 (E3) (8°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact
Route 2D - M18 (E3) (25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels Views are not predicted in practice	N/A	N/A	No impact
Route 2D - M18 (E4) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact

Road Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Considering screening[1], do reflections remain inside the primary FOV	Mitigating Factors	Predicted Impact Classification
Route 2D - M18 (E5) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to significantly obstruct views of reflecting panels. Views are not predicted in practice	N/A	N/A	No impact
Route 2D - M18 (E6 – E7) (8° & 25°)	Solar reflections **are** geometrically possible and occur **outside** a road user's primary FOV	Existing vegetation is predicted to partially obstruct views of reflecting panels. Residual views are predicted	Reflections occur **outside** a road user's primary FOV	N/A	Low impact

Table 5 *Geometric modelling results - road receptors (E)*

Assessment Results – Dwelling Receptors

Key Considerations

The key considerations for residential dwellings are:

- Whether a reflection is predicted to be experienced in practice;
- The duration of the predicted effects, relative to thresholds of:
  - Three months per year;
  - 60 minutes on any given day.

Where solar reflections are not geometrically possible, or the reflecting panels are predicted to be significantly obstructed from view, no impact is predicted, and mitigation is not required.

Where effects occur for **less** than three months per year and **less** than 60 minutes on any given day, or the closest reflecting panel is over 1km from the dwelling, the impact significance is low, and mitigation is not recommended.

Where reflections are predicted to be experienced for **more** than three months per year and/or for **more** than 60 minutes on any given day, expert assessment of the following factors is required to determine the impact significance and mitigation requirement:

- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not;
- Whether visibility is likely from all storeys – the ground floor is typically considered the main living space and has a greater significance with respect to residential amenity;
- Whether the dwelling appears to have windows facing the reflecting area – factors that restrict potential views of a reflecting area reduce the level of impact.

Following consideration of these mitigating factors, where the solar reflection is not deemed significant, a low impact is predicted, and mitigation is not recommended. Where the solar reflection is deemed significant, the impact significance is moderate, and mitigation is recommended.

If effects last for **more** than three months per year and for **more** than 60 minutes on any given day, and there are no mitigating factors, the impact significance is high, and mitigation is required.

Geometric Modelling Results

Table 6 on the following pages presents:

- Geometric modelling results (prior to consideration of screening);
- Desk-based review of identified screening;
- Consideration of mitigating factors present, where appropriate;
- Predicted impact significance.

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Duration of reflections (with consideration of screening)[2]	Mitigating Factors	Predicted Impact Classification
W1 - 29, 30 + 38 (modelling charts number: 1 – 3) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing vegetation is predicted to significantly obstruct views of reflecting panels from the ground floor Residual views above ground floor are considered possible	Ground floor: None Above ground floor: **More** than 3 months **Less** than 60 minutes	Views are restricted to above the ground floor Reflections mostly coincide with direct sunlight	Low impact
W1 – 37 (modelling charts number: 4) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	None identified	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight	**Moderate impact**
W1 – 31 (modelling charts number: 5) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing buildings are predicted to significantly obstruct views of reflecting panels Views are not predicted in practice	None	N/A	No impact

[2] Assessment scenario may include an initial conservative qualitative consideration of screening in determining the duration of predicated effects in practice. The reflecting area of the solar development may be partially screened such that it does not meet the two key criteria i.e. 1) The solar reflection occurs for more than 3 months per year. 2) and/or for more than 60 minutes on any given day.

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Duration of reflections (with consideration of screening)[2]	Mitigating Factors	Predicted Impact Classification
W2 – 19 (modelling charts number: 6) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	None identified	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight	**Moderate impact**
W2 – 21 (modelling charts number: 7) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	None identified	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight Reflections originate over 950m from the receptor	Low impact
W2 – 50 + 82 (modelling charts number: 8 – 9) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing vegetation is predicted to significantly obstruct views of reflecting panels from the ground floor Residual views above ground floor are considered possible	Ground floor: None Above ground floor: **More** than 3 months **Less** than 60 minutes	Views are restricted to above the ground floor Reflections mostly coincide with direct sunlight Reflections originate over 600m from the receptor	Low impact

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Duration of reflections (with consideration of screening)[2]	Mitigating Factors	Predicted Impact Classification
W2 - 107 (modelling charts number: 10) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing vegetation and buildings are predicted to significantly obstruct views of reflecting panels Views are not predicted in practice	None	N/A	No impact
W2 – 91 + 92 W3 - 9 + 10 (modelling charts number: 11-14) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	None identified	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight	**Moderate impact**
W3 – 21 (modelling charts number: 15) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	None identified	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight Reflections originate over 850m from the receptor	Low impact

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Duration of reflections (with consideration of screening)[2]	Mitigating Factors	Predicted Impact Classification
W2 - 7 + 8 (modelling charts number:16 – 17) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight	**Moderate impact**
W2 – 18 (modelling charts number: 18) (8°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing vegetation is predicted to partially obstruct views of reflecting panels Residual views are predicted	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight Reflections originate over 800m from the receptor Windows of dwelling do not face reflecting areas	Low impact
W2 – 18 (modelling charts number: 18) (25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing vegetation and buildings are predicted to significantly obstruct views of reflecting panels Views are not predicted in practice	None	N/A	No impact

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Duration of reflections (with consideration of screening)[2]	Mitigating Factors	Predicted Impact Classification
W2 – 78 (modelling charts number: 19) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	None identified	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight	**Moderate impact**
W2 – 89 (modelling charts number: 20) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Existing vegetation is predicted to significantly obstruct views of reflecting panels Views are not predicted in practice	None	N/A	No impact
W2 – 104 (modelling charts number: 21) (8° & 25°)	Solar reflections **are** geometrically possible for: **More** than 3 months **Less** than 60 minutes	Intervening terrain is predicted to partially obstruct views of reflecting panels Residual views are predicted	**More** than 3 months **Less** than 60 minutes	Reflections mostly coincide with direct sunlight Reflections originate over 700m from the receptor Windows of dwelling do not face reflecting areas	Low impact

Dwelling Receptor	Geometric Modelling Results (screening not considered)	Identified Screening and Predicted Visibility (desk-based review)	Duration of reflections (with consideration of screening)[2]	Mitigating Factors	Predicted Impact Classification
W3 – 25 (modelling charts number: 22) (8° & 25°)	Solar reflections **are** geometrically possible for: **Less** than 3 months **Less** than 60 minutes	Existing buildings are predicted to significantly obstruct views of reflecting panels from the ground floor Residual views above ground floor are considered possible	Ground floor: None Above ground floor: **Less** than 3 months **Less** than 60 minutes	N/A	Low impact

Table 6 *Geometric modelling results - dwelling receptors*

APPENDIX – GLINT AND GLARE IMPACT SIGNIFICANCE

Overview

The significance of glint and glare will vary for different receptors. The following section presents a general overview of the significance criteria with respect to experiencing a solar reflection.

Impact Significance Definition

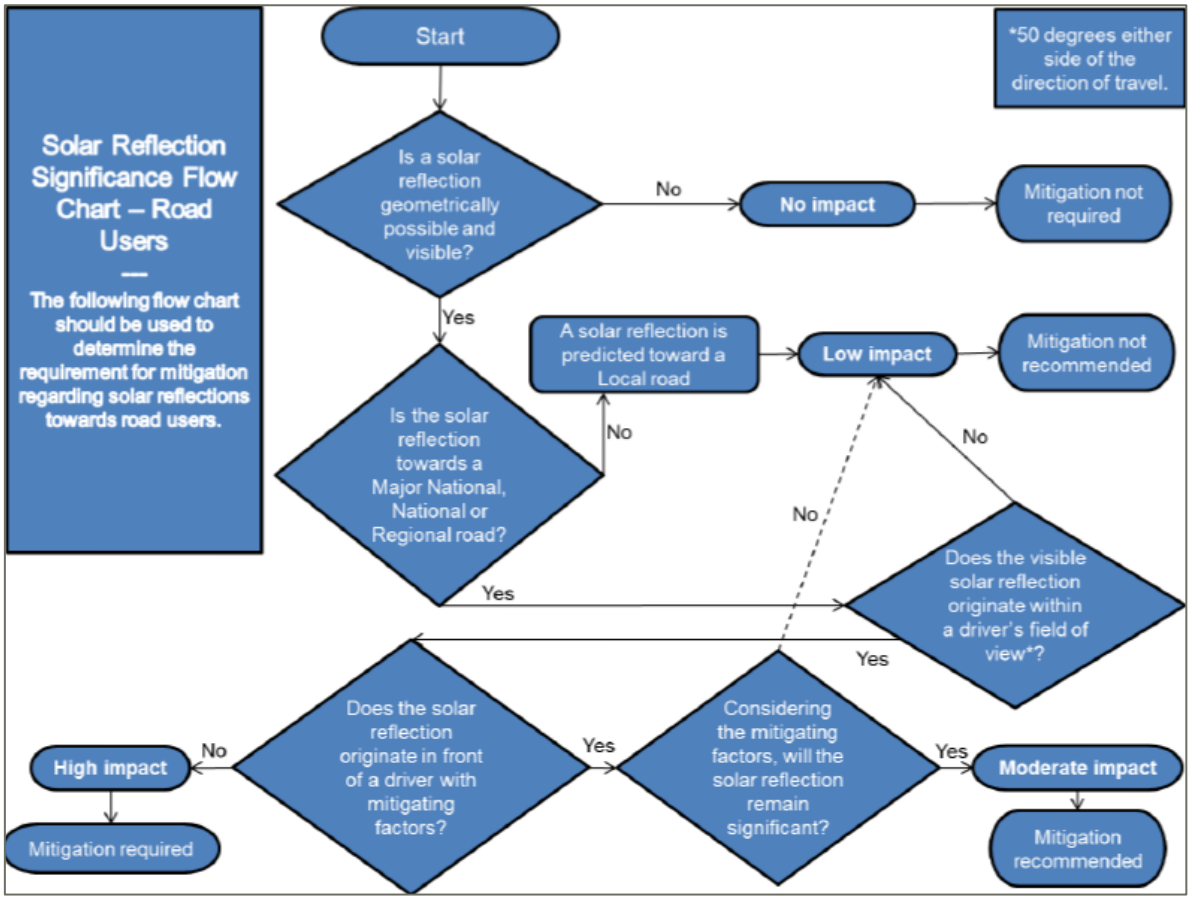
The table below presents the recommended definition of 'impact significance' in glint and glare terms and the requirement for mitigation under each.

Impact Significance	Definition	Mitigation Requirement
No Impact	A solar reflection is not geometrically possible or will not be visible from the assessed receptor.	No mitigation required.
Low	A solar reflection is geometrically possible however any impact is considered to be small such that mitigation is not required e.g. intervening screening will limit the view of the reflecting solar panels significantly.	No mitigation recommended.
Moderate	A solar reflection is geometrically possible and visible however it occurs under conditions that do not represent a worst-case given individual receptor criteria.	Mitigation recommended.
High	A solar reflection is geometrically possible and visible under worst-case conditions that will produce a significant impact given individual receptor criteria	Mitigation will be required if the proposed development is to proceed.

Impact significance definition

Impact Significance Determination for Road Receptors

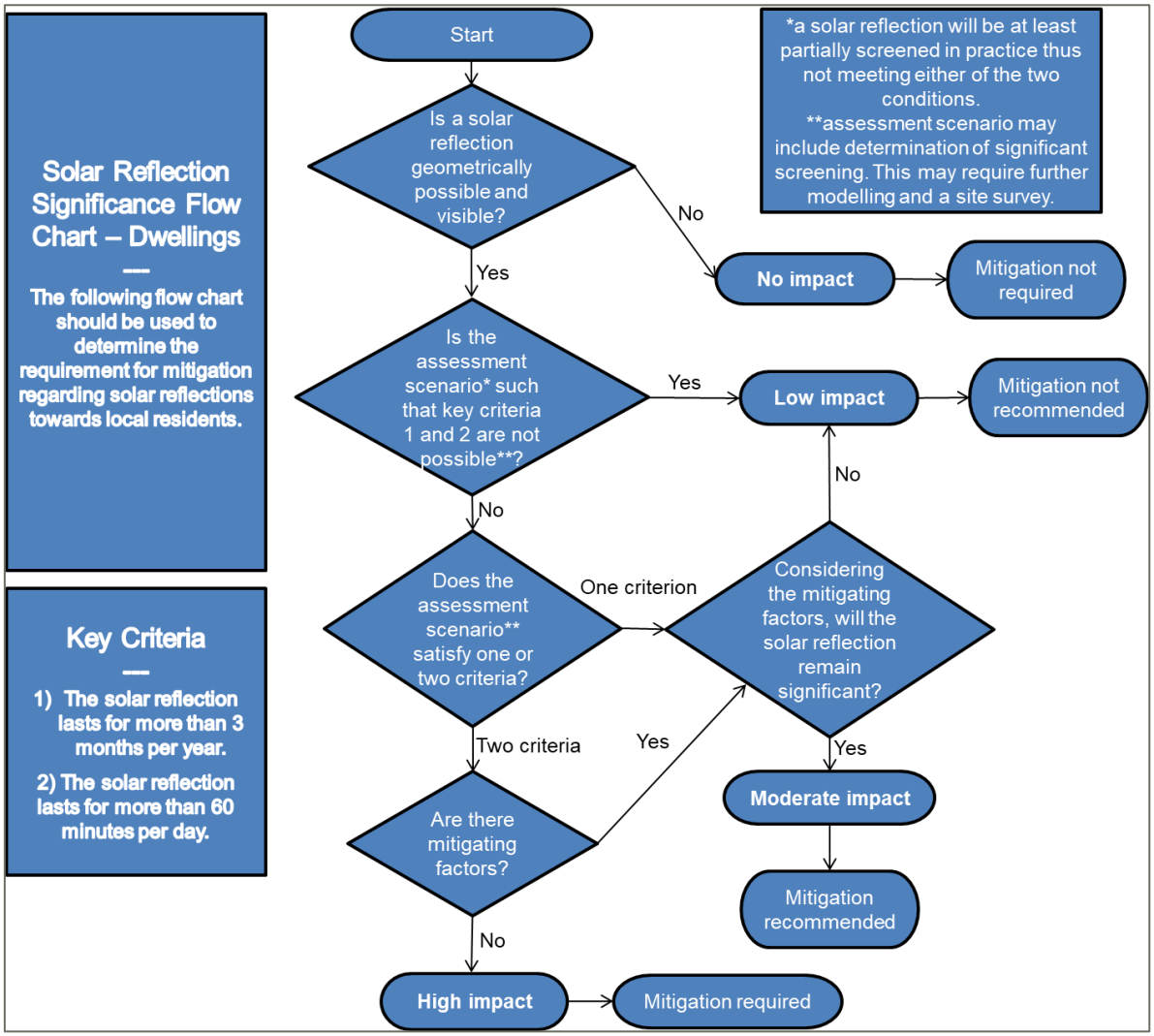
The flow chart presented below has been followed when determining the impact significance for road receptors.



Road receptor impact significance flow chart

Impact Significance Determination for Dwelling Receptors

The flow chart presented below has been followed when determining the impact significance for dwelling receptors.



Dwelling receptor impact significance flow chart



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PAGERPOWER

Glint and Glare Modelling

ERM Limited

Whitestones Solar

March 2026



www.pagerpower.com

MODELLING CHARTS

Overview

The Pager Power charts for the receptors are shown on the following pages. Each chart shows:

- The receptor (observer) location – top right image. This also shows the azimuth range of the Sun itself at times when reflections are possible. If sunlight is experienced from the same direction as the reflecting panels, the overall impact of the reflection is reduced as discussed within the body of the report;
- The reflecting panels – bottom right image. The reflecting area is shown in yellow. If the yellow panels are not visible from the observer location, no issues will occur in practice. Additional obstructions which may obscure the panels from view are considered separately within the analysis;
    - Where the panel area is large such that the visualisation is zoomed out to such a degree that interpretation is not practical, this image may be omitted by the software. A KML file of reflecting areas accompanies this report in lieu of this image.
    - Within the KML file, panel areas are shown in blue and outlined in pink. The reflecting area for each receptor is shown in yellow.
- The reflection date/time graph – left hand side of the page. The blue line indicates the dates and times at which geometric reflections are possible. This relates to reflections from the yellow areas;
- The sunrise and sunset curves throughout the year (red and yellow lines).

The geometric modelling has been carried out considering the following parameters:

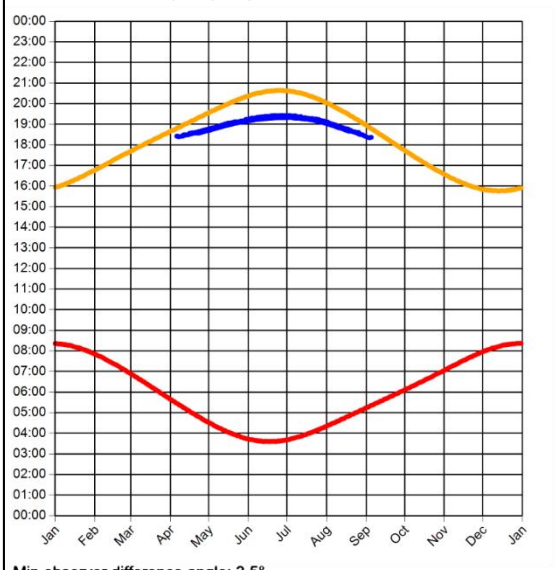
- Azimuth angle: 180° (south facing);
- Tilt angle: 8° and 25°;
    - Each receptor has been assessed twice, once considering an angle of 8° and again considering an angle of 25°.
- Height above ground: 3.8m.

Road Receptors

Panel tilt: 8 degrees

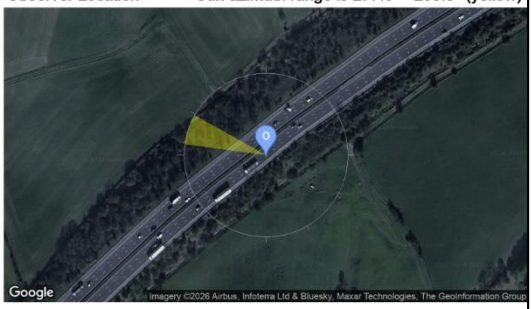
Observer A1 Results

Reflection Date/Time (GMT) Graph



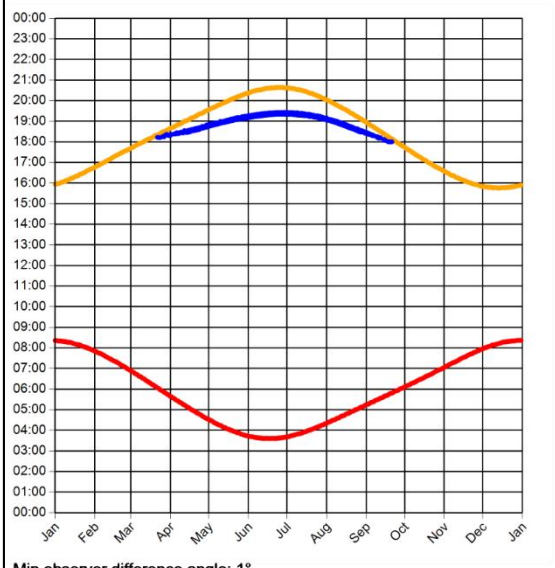
Min observer difference angle: 3.5°
Max observer difference angle: 9.7°

Observer Location — Sun azimuth range is 277.6° - 299.3° (yellow)



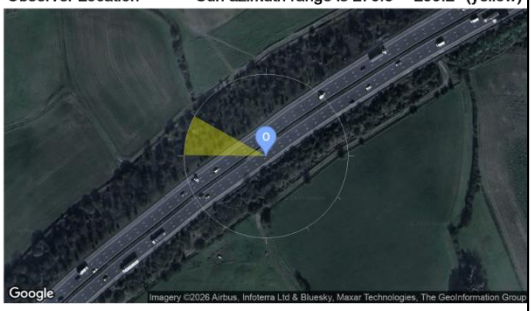
Observer A2 Results

Reflection Date/Time (GMT) Graph



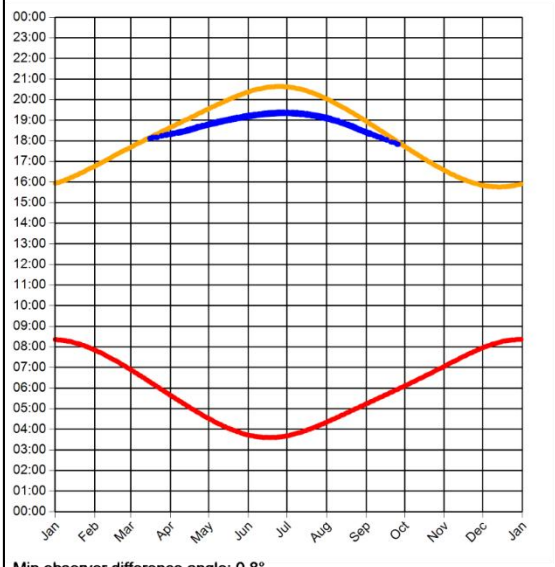
Min observer difference angle: 1°
Max observer difference angle: 9.4°

Observer Location — Sun azimuth range is 270.8° - 299.2° (yellow)



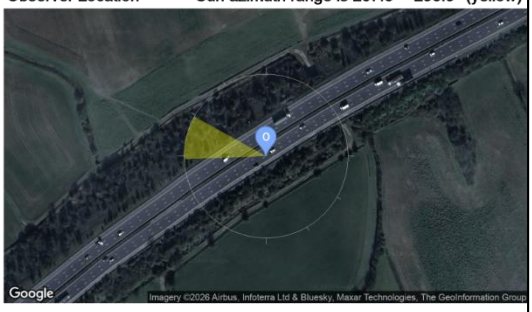
Observer A3 Results

Reflection Date/Time (GMT) Graph



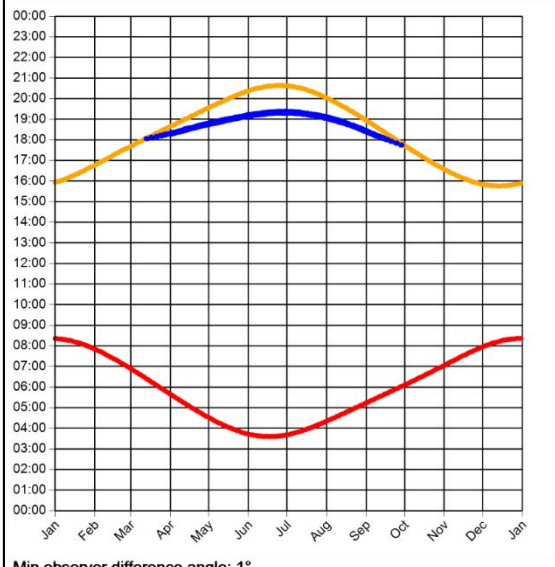
Min observer difference angle: 0.8°
Max observer difference angle: 9.9°

Observer Location — Sun azimuth range is 267.8° - 298.9° (yellow)



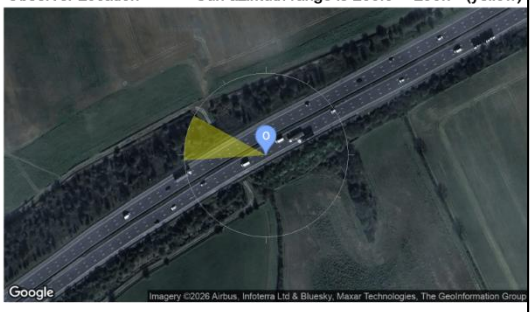
Observer A4 Results

Reflection Date/Time (GMT) Graph



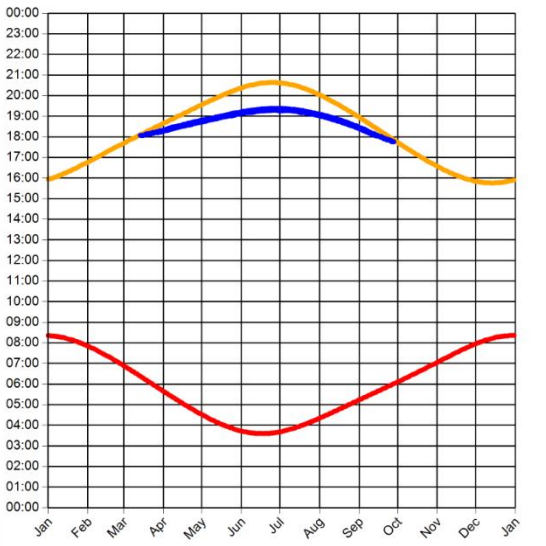
Min observer difference angle: 1°
Max observer difference angle: 10.3°

Observer Location — Sun azimuth range is 266.3° - 298.7° (yellow)



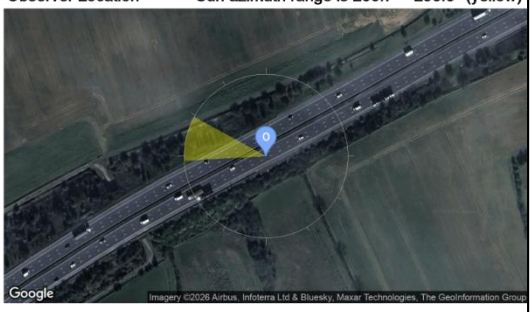
Observer A5 Results

Reflection Date/Time (GMT) Graph



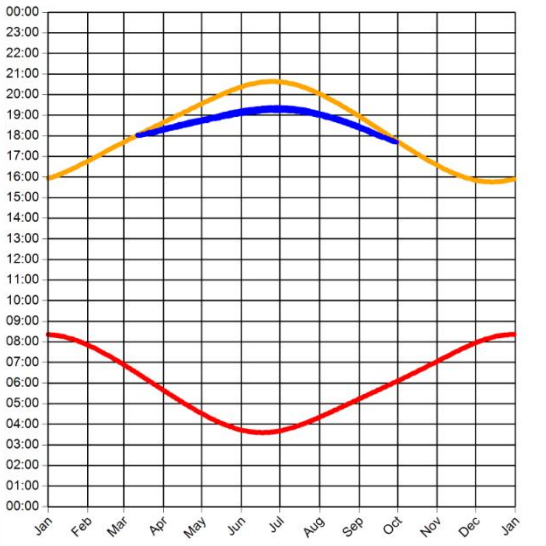
Min observer difference angle: 1.2°
Max observer difference angle: 10.6°

Observer Location — Sun azimuth range is 266.7° - 298.8° (yellow)



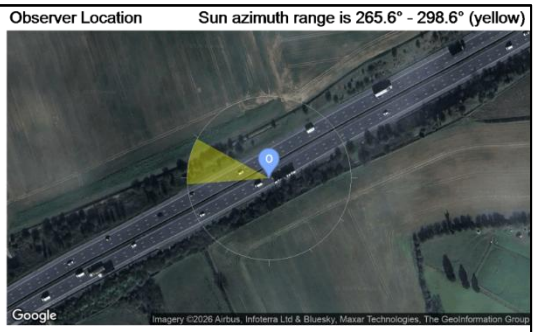
Observer A6 Results

Reflection Date/Time (GMT) Graph



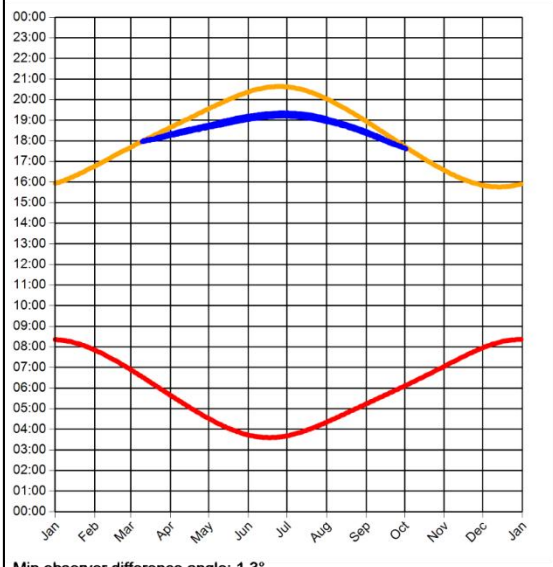
Min observer difference angle: 1.1°
Max observer difference angle: 11.4°

Observer Location — Sun azimuth range is 265.6° - 298.6° (yellow)



Observer A7 Results

Reflection Date/Time (GMT) Graph



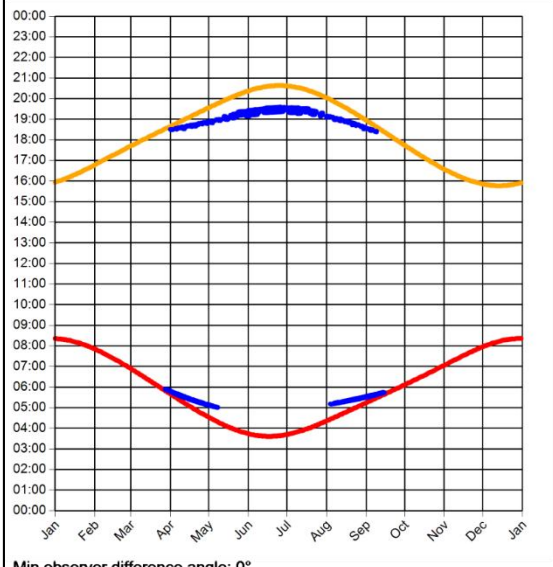
Observer Location — Sun azimuth range is 264.2° - 298.4° (yellow)



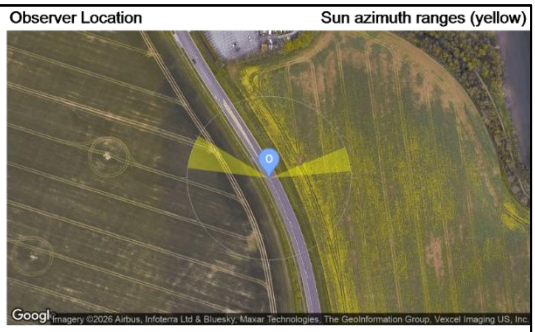
Min observer difference angle: 1.3°
Max observer difference angle: 11.9°

Observer B1 Results

Reflection Date/Time (GMT) Graph



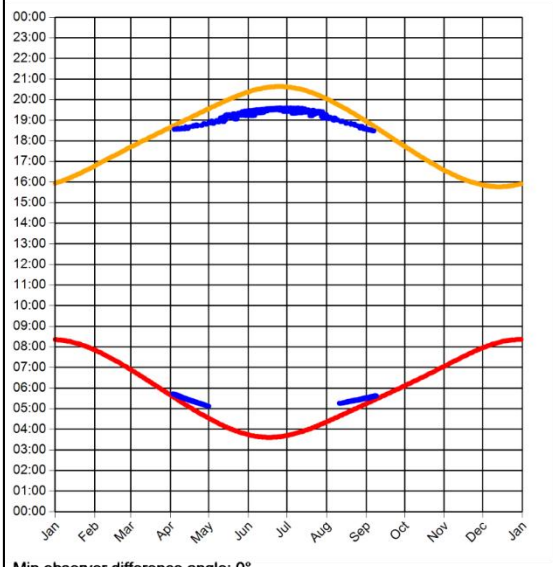
Observer Location — Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 9.6°

Observer B2 Results

Reflection Date/Time (GMT) Graph



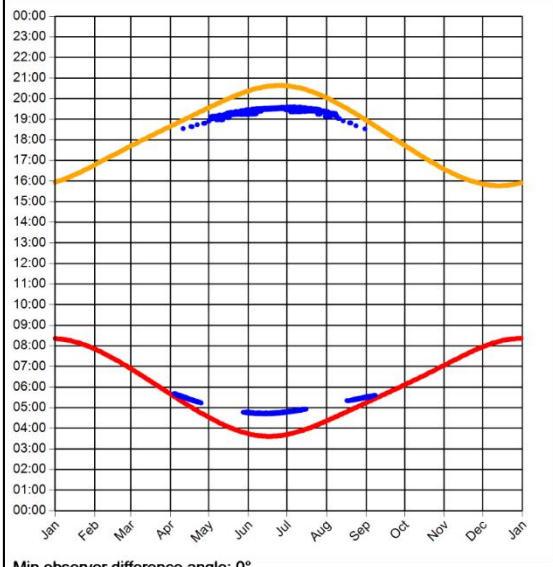
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 9.1°

Observer B3 Results

Reflection Date/Time (GMT) Graph



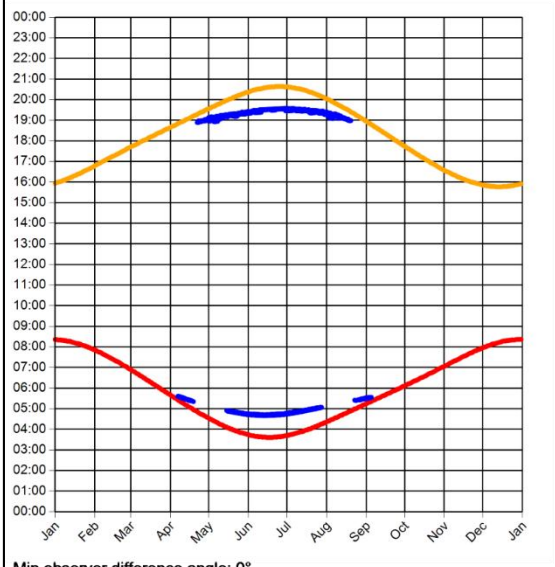
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 8.7°

Observer B4 Results

Reflection Date/Time (GMT) Graph



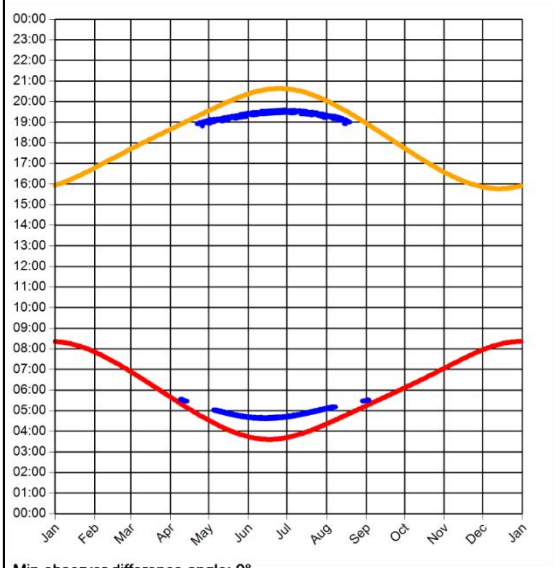
Observer Location | Sun azimuth ranges (yellow)



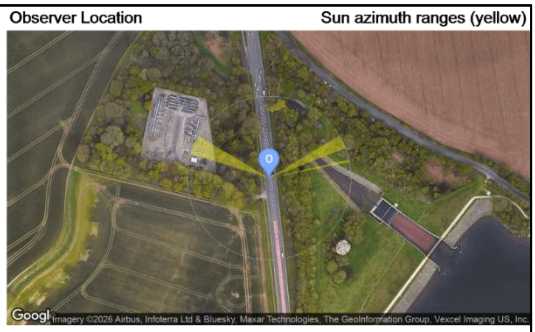
Min observer difference angle: 0°
Max observer difference angle: 7.2°

Observer B5 Results

Reflection Date/Time (GMT) Graph



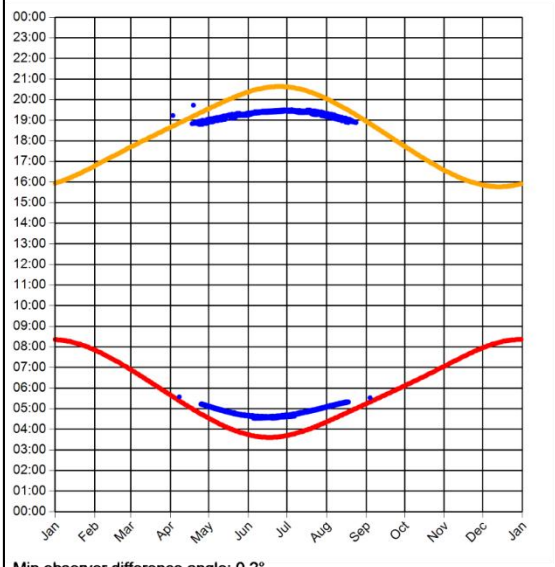
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 7.2°

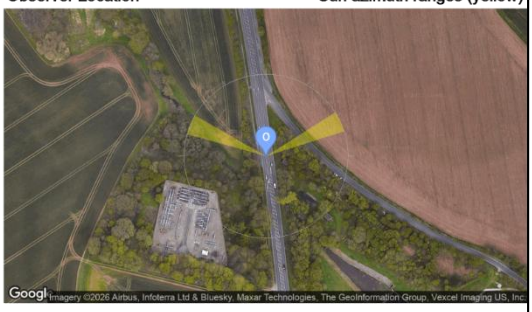
Observer B6 Results

Reflection Date/Time (GMT) Graph



Observer Location

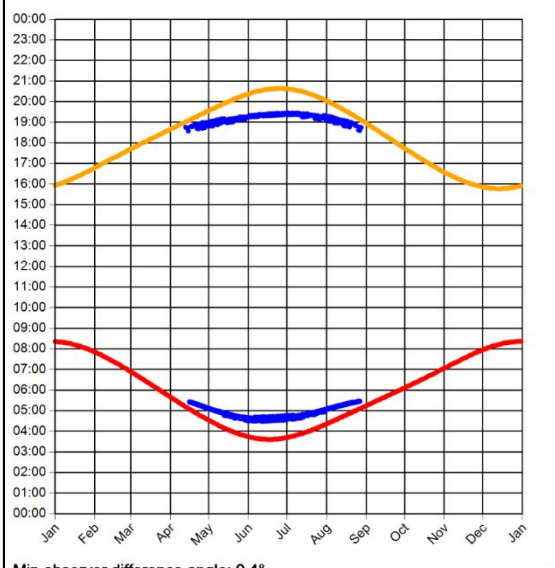
Sun azimuth ranges (yellow)



Min observer difference angle: 0.2°
Max observer difference angle: 8.1°

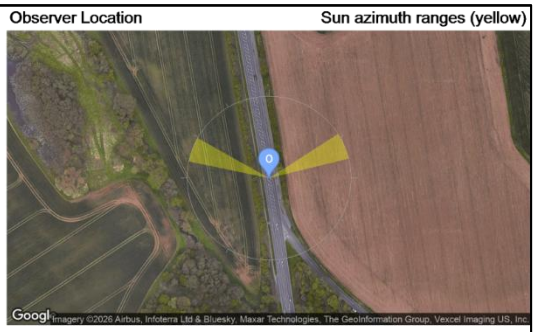
Observer B7 Results

Reflection Date/Time (GMT) Graph



Observer Location

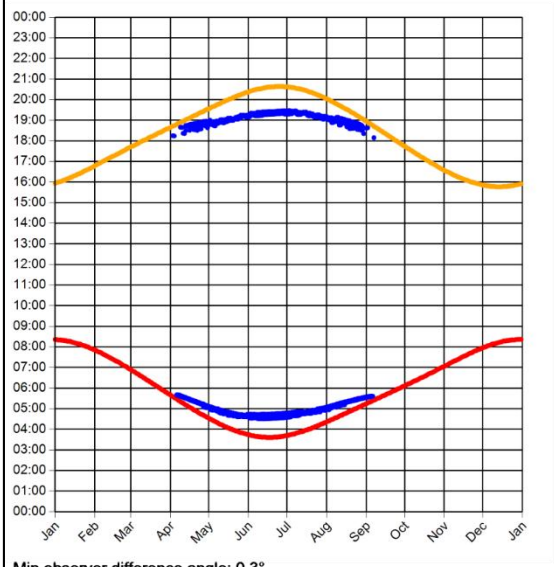
Sun azimuth ranges (yellow)



Min observer difference angle: 0.4°
Max observer difference angle: 9.4°

Observer B8 Results

Reflection Date/Time (GMT) Graph



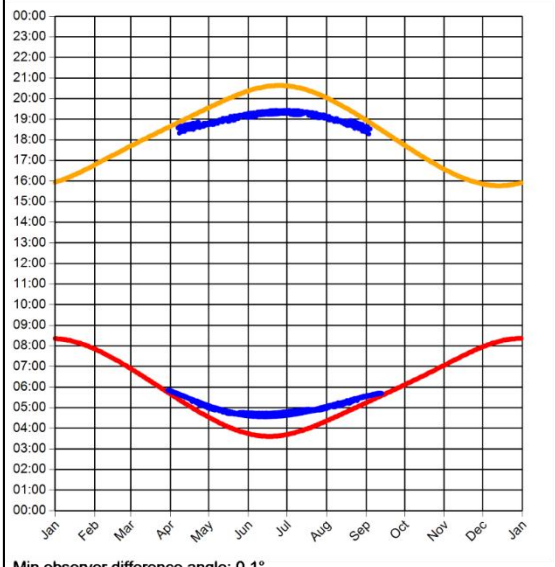
Observer Location | Sun azimuth ranges (yellow)



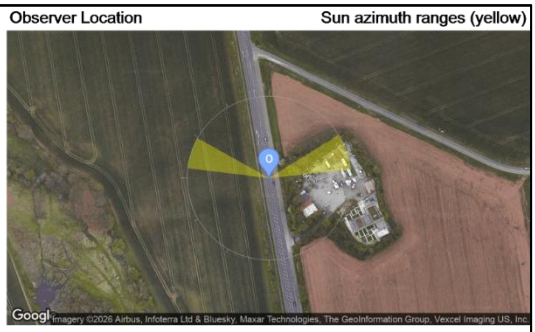
Min observer difference angle: 0.3°
Max observer difference angle: 10°

Observer B9 Results

Reflection Date/Time (GMT) Graph



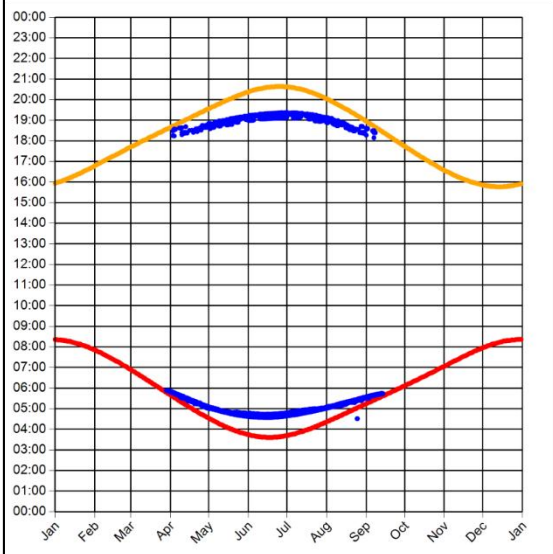
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0.1°
Max observer difference angle: 11.1°

Observer B10 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.1°
Max observer difference angle: 13.7°

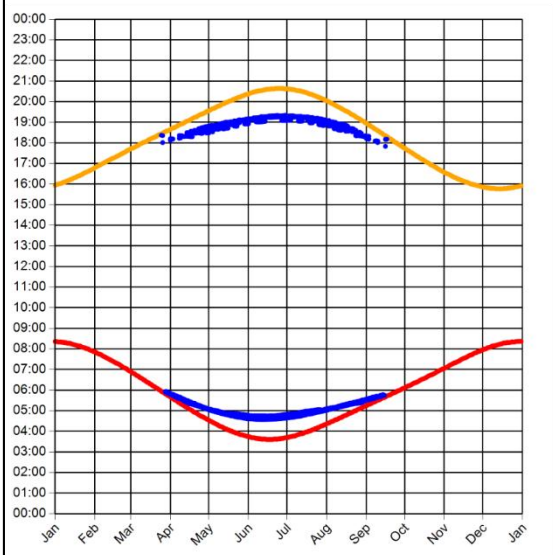
Observer Location

Sun azimuth ranges (yellow)



Observer B11 Results

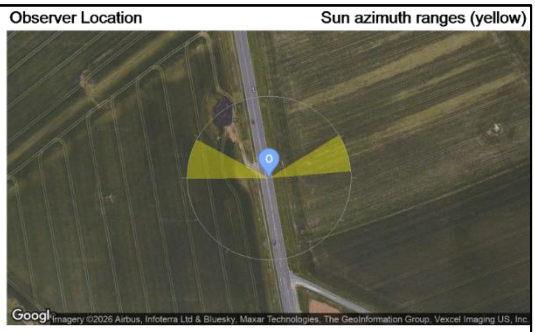
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 14°

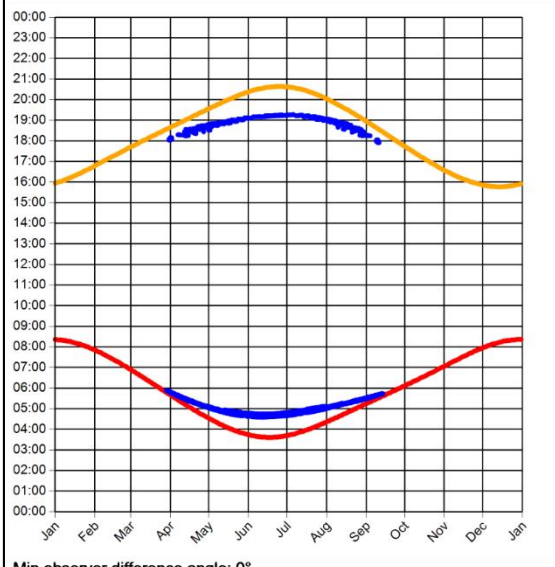
Observer Location

Sun azimuth ranges (yellow)

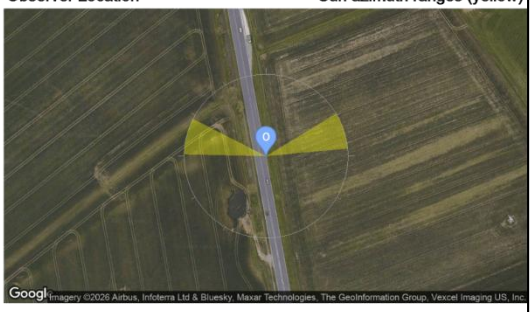


Observer B12 Results

Reflection Date/Time (GMT) Graph



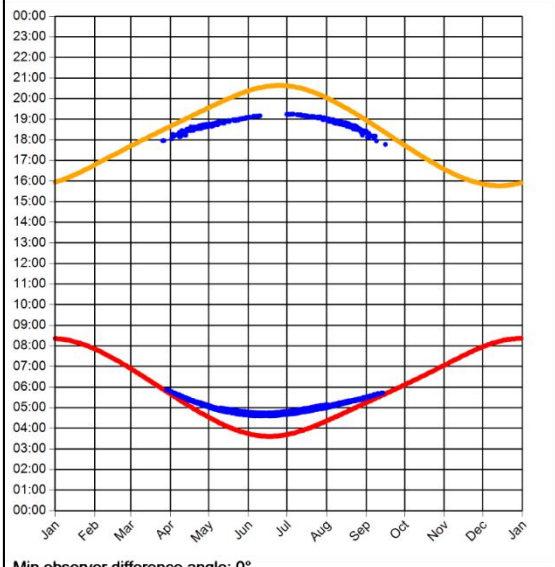
Observer Location | Sun azimuth ranges (yellow)



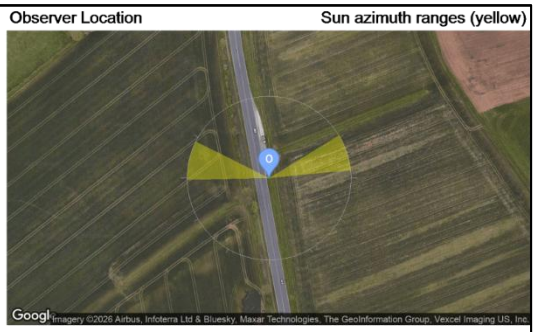
Min observer difference angle: 0°
Max observer difference angle: 12.1°

Observer B13 Results

Reflection Date/Time (GMT) Graph



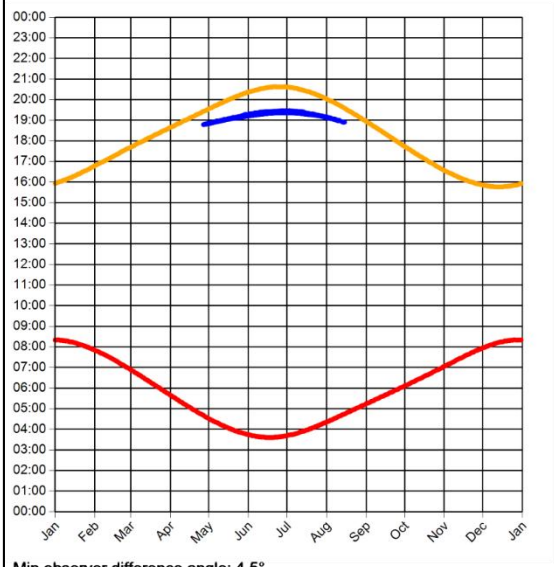
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 11.1°

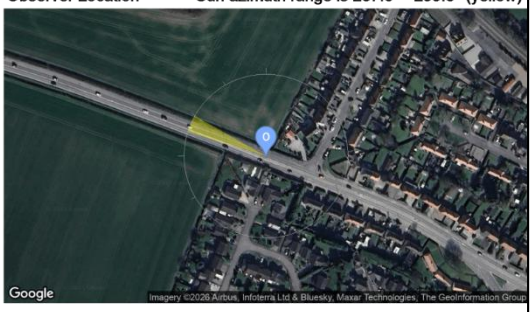
Observer C1 Results

Reflection Date/Time (GMT) Graph



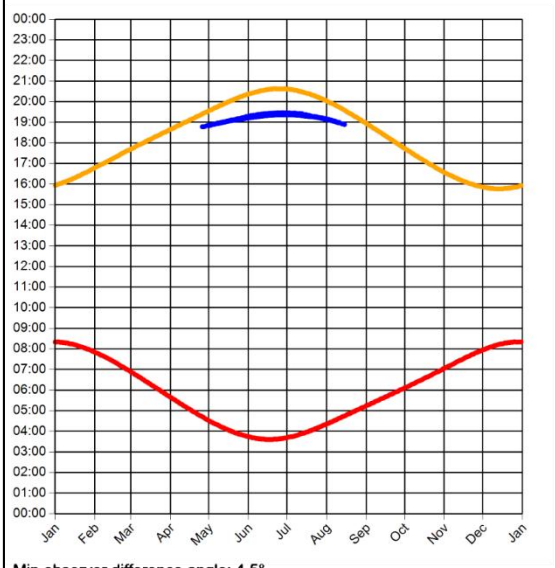
Min observer difference angle: 4.5°
Max observer difference angle: 8.9°

Observer Location — Sun azimuth range is 287.3° - 299.5° (yellow)



Observer C2 Results

Reflection Date/Time (GMT) Graph



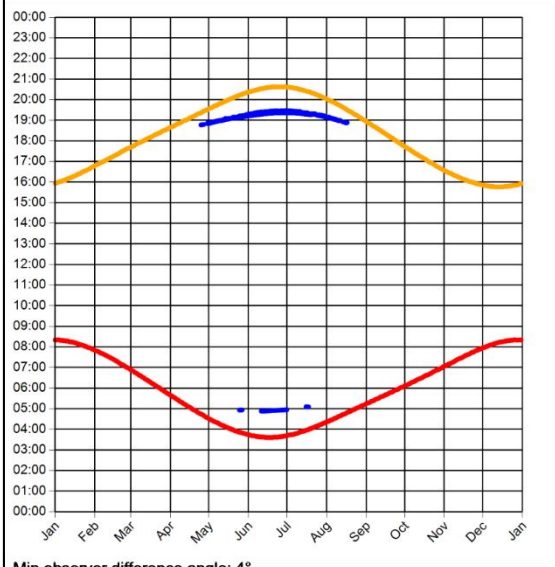
Min observer difference angle: 4.5°
Max observer difference angle: 8.9°

Observer Location — Sun azimuth range is 287° - 299.6° (yellow)

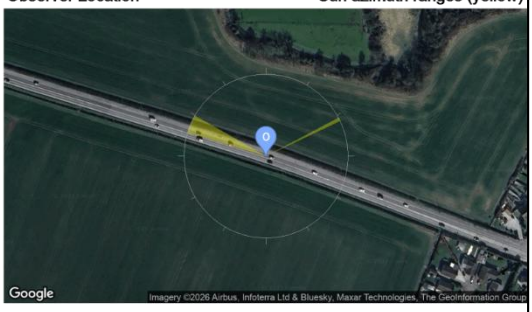


Observer C3 Results

Reflection Date/Time (GMT) Graph



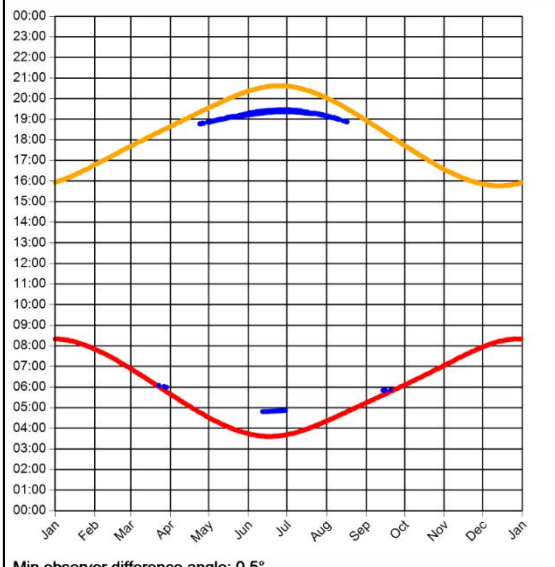
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 4°
Max observer difference angle: 10°

Observer C4 Results

Reflection Date/Time (GMT) Graph



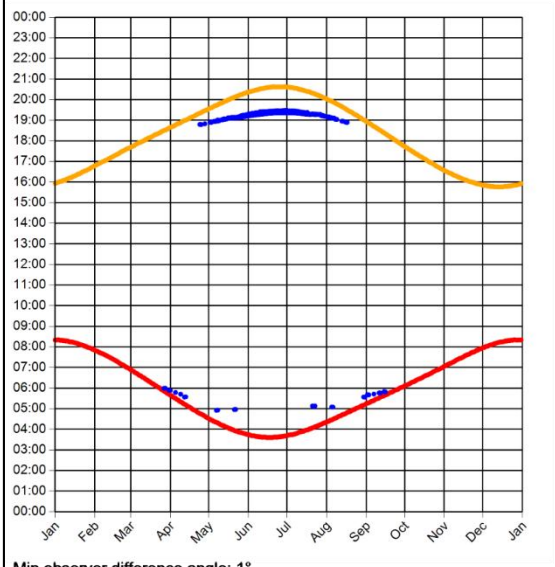
Observer Location | Sun azimuth ranges (yellow)



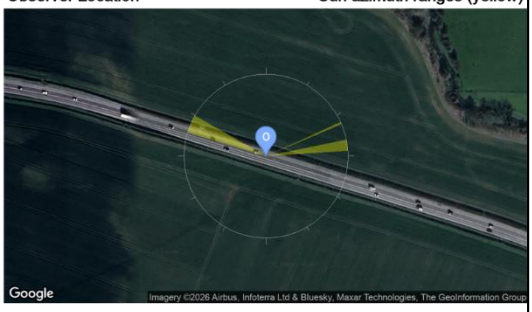
Min observer difference angle: 0.5°
Max observer difference angle: 8.8°

Observer C5 Results

Reflection Date/Time (GMT) Graph



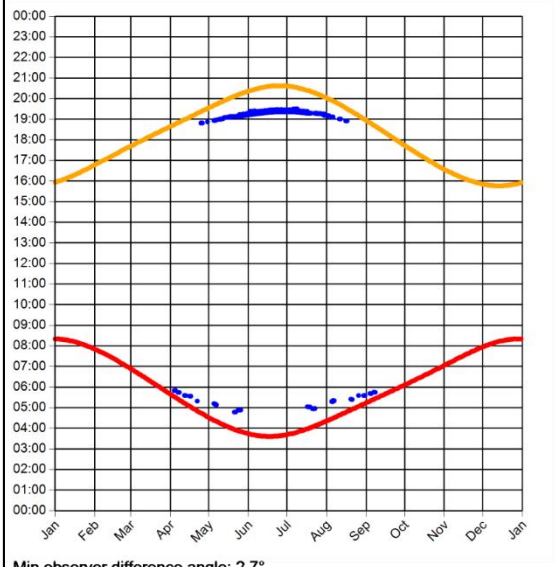
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 1°
Max observer difference angle: 8.8°

Observer C6 Results

Reflection Date/Time (GMT) Graph



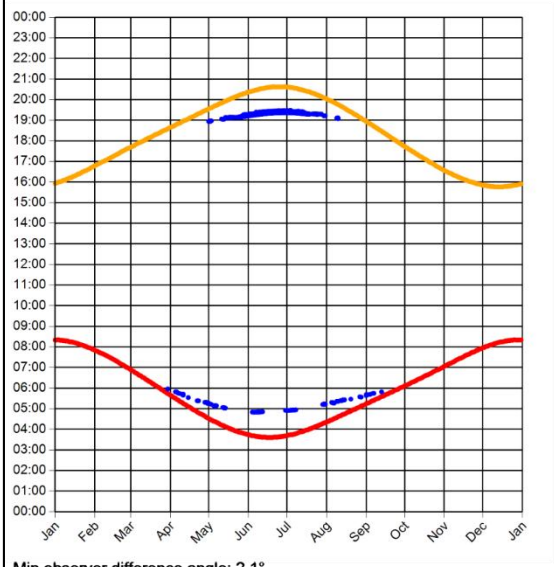
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 2.7°
Max observer difference angle: 8.9°

Observer C7 Results

Reflection Date/Time (GMT) Graph



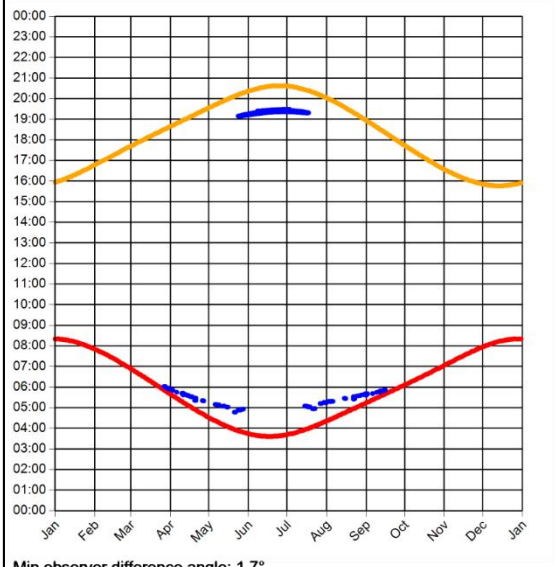
Observer Location | Sun azimuth ranges (yellow)



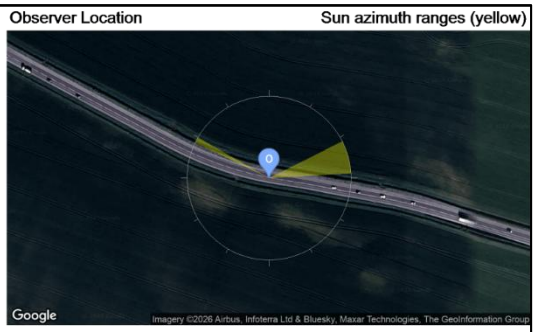
Min observer difference angle: 2.1°
Max observer difference angle: 8.9°

Observer C8 Results

Reflection Date/Time (GMT) Graph



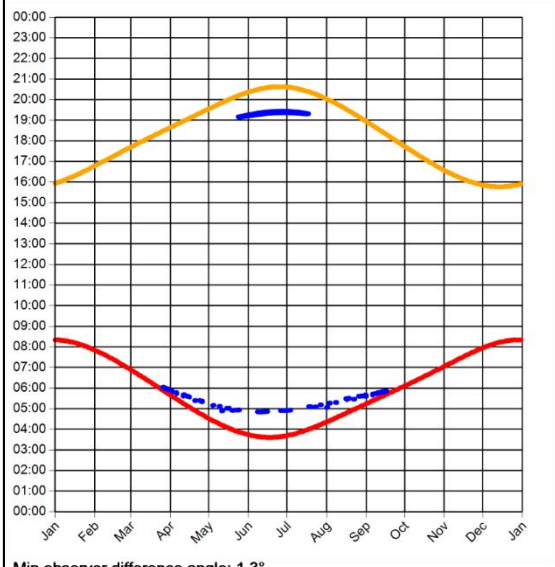
Observer Location | Sun azimuth ranges (yellow)



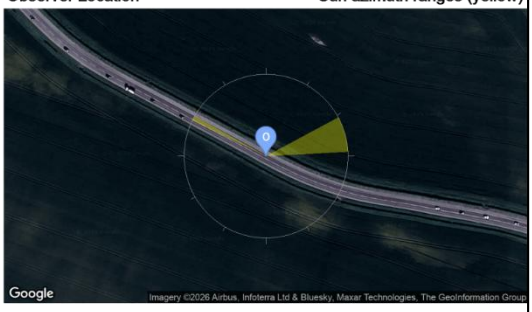
Min observer difference angle: 1.7°
Max observer difference angle: 8.8°

Observer C9 Results

Reflection Date/Time (GMT) Graph



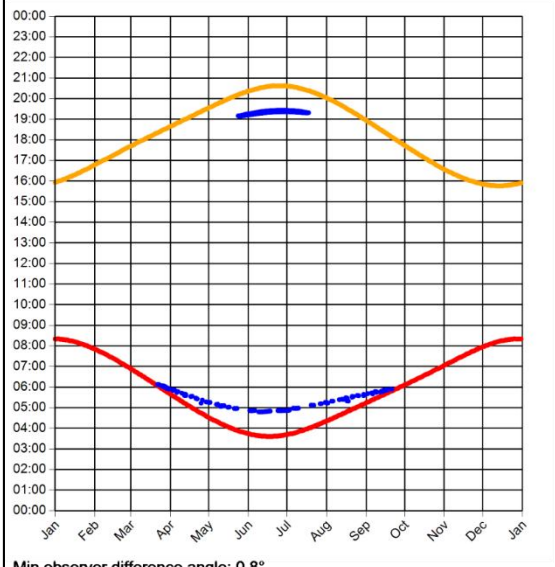
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 1.3°
Max observer difference angle: 9.2°

Observer C10 Results

Reflection Date/Time (GMT) Graph



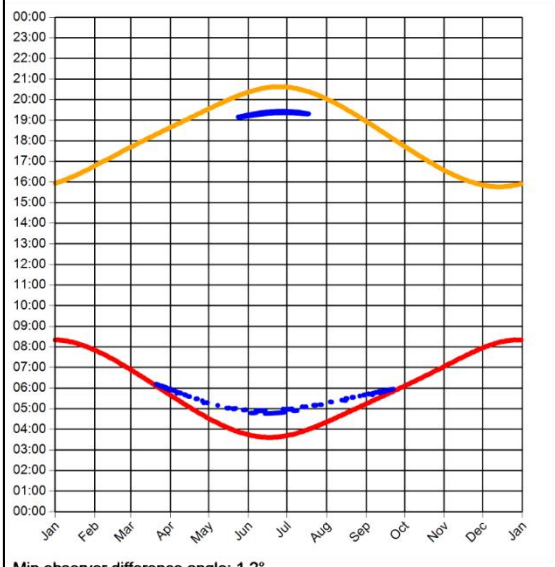
Observer Location | Sun azimuth ranges (yellow)



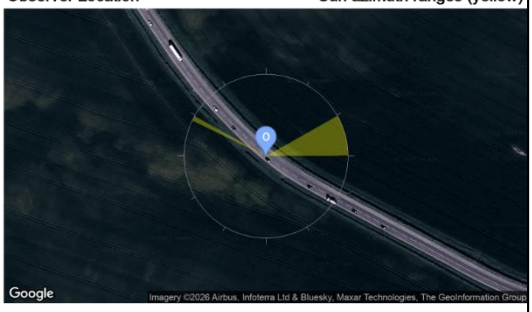
Min observer difference angle: 0.8°
Max observer difference angle: 8.8°

Observer C11 Results

Reflection Date/Time (GMT) Graph



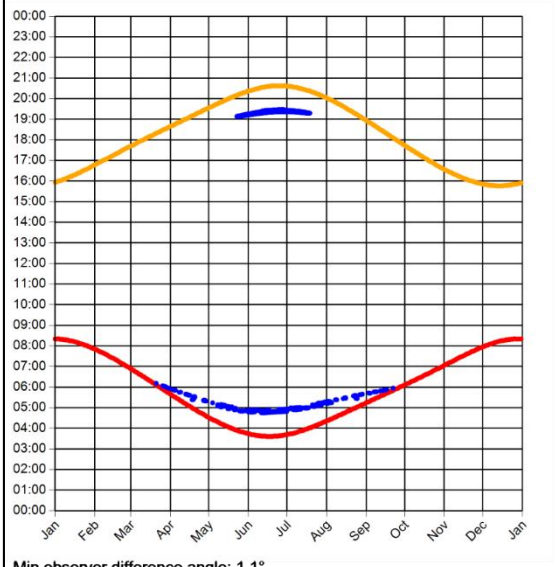
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 1.2°
Max observer difference angle: 10.1°

Observer C12 Results

Reflection Date/Time (GMT) Graph



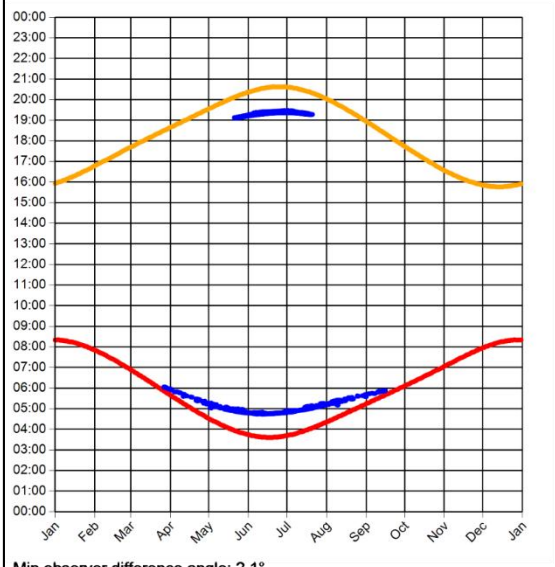
Observer Location | Sun azimuth ranges (yellow)



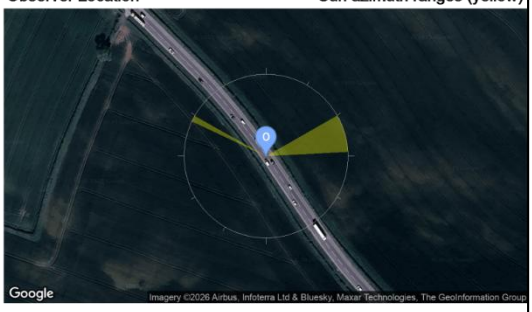
Min observer difference angle: 1.1°
Max observer difference angle: 9.6°

Observer C13 Results

Reflection Date/Time (GMT) Graph



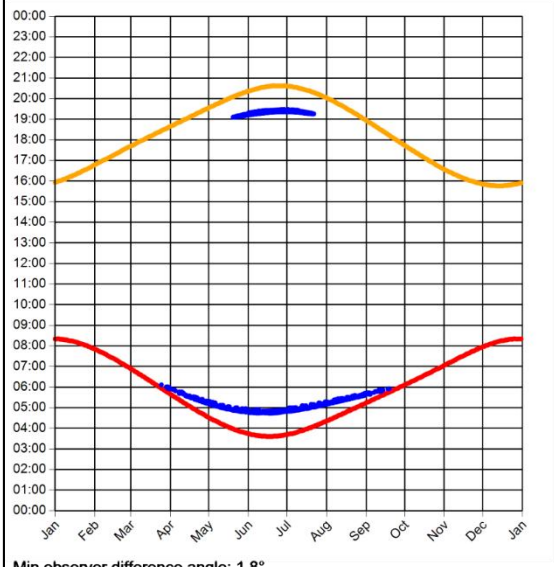
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 2.1°
Max observer difference angle: 9.1°

Observer C14 Results

Reflection Date/Time (GMT) Graph



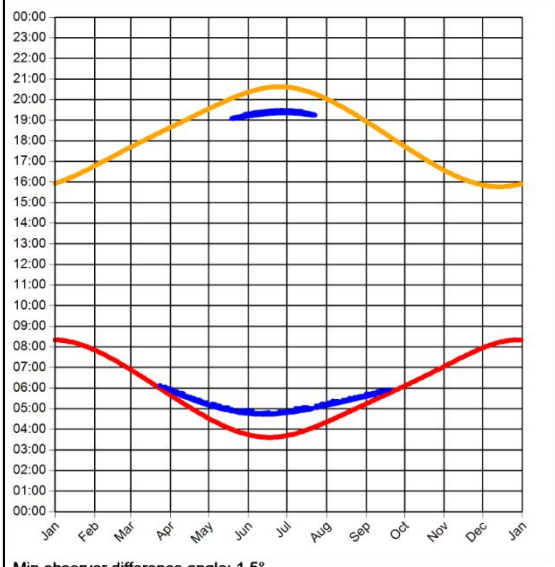
Observer Location | Sun azimuth ranges (yellow)



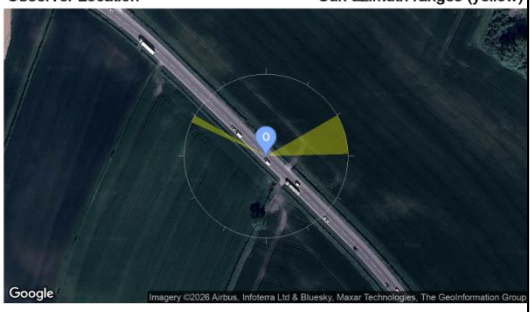
Min observer difference angle: 1.8°
Max observer difference angle: 9.8°

Observer C15 Results

Reflection Date/Time (GMT) Graph



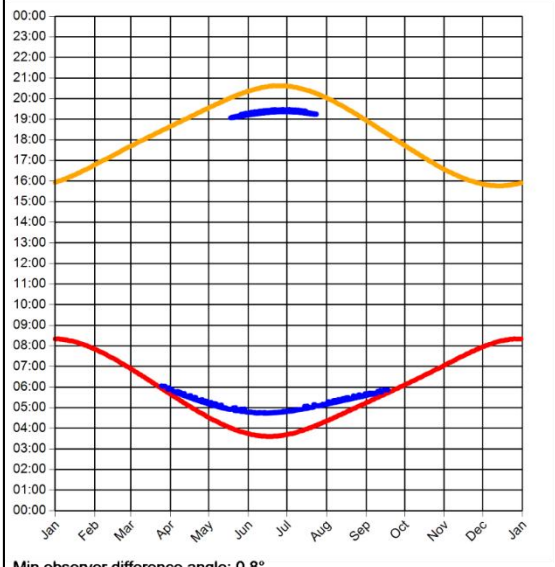
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 1.5°
Max observer difference angle: 9.1°

Observer C16 Results

Reflection Date/Time (GMT) Graph



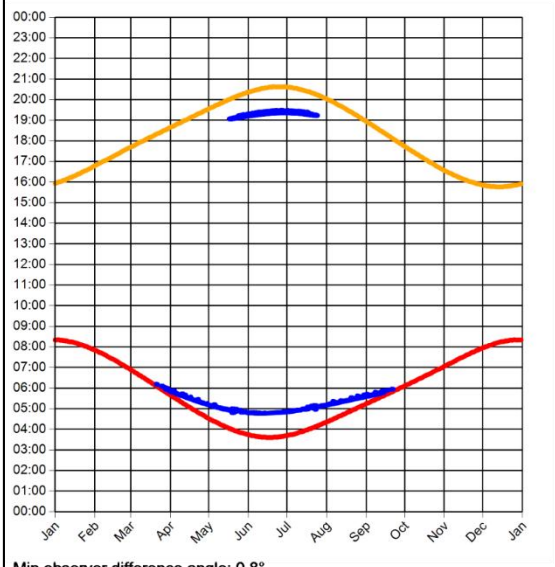
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0.8°
Max observer difference angle: 9°

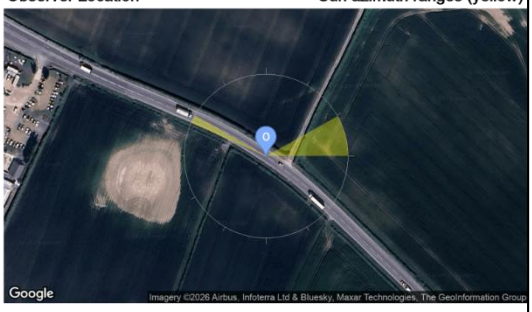
Observer C17 Results

Reflection Date/Time (GMT) Graph



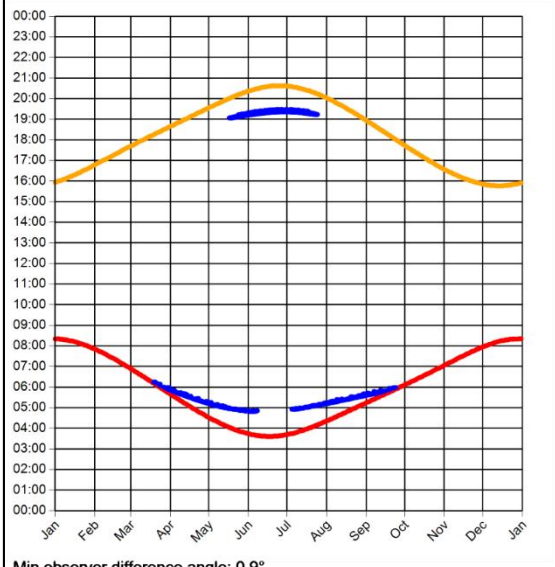
Min observer difference angle: 0.8°
Max observer difference angle: 9°

Observer Location | Sun azimuth ranges (yellow)



Observer C18 Results

Reflection Date/Time (GMT) Graph



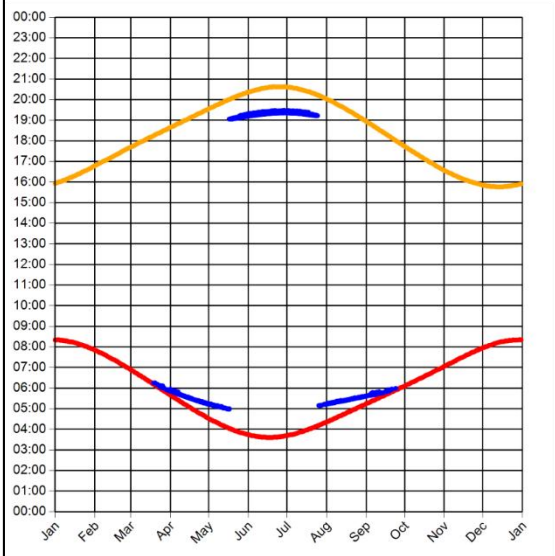
Min observer difference angle: 0.9°
Max observer difference angle: 9.1°

Observer Location | Sun azimuth ranges (yellow)



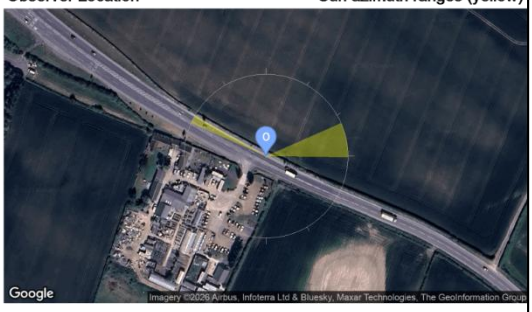
Observer C19 Results

Reflection Date/Time (GMT) Graph



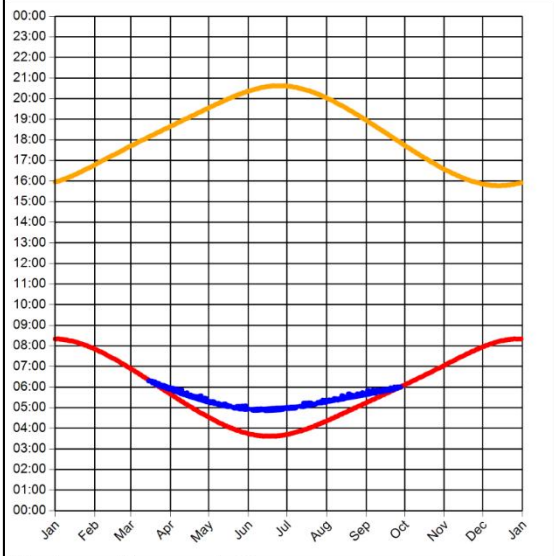
Min observer difference angle: 0.7°
Max observer difference angle: 9.1°

Observer Location — Sun azimuth ranges (yellow)



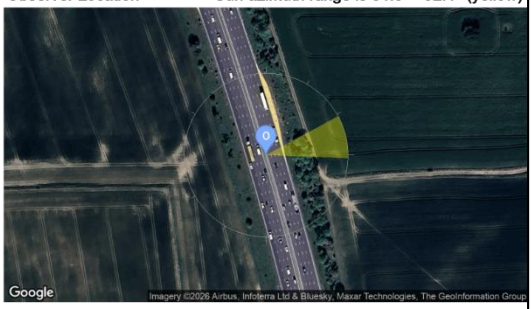
Observer D1 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 11.9°

Observer Location — Sun azimuth range is 61.5° - 92.1° (yellow)

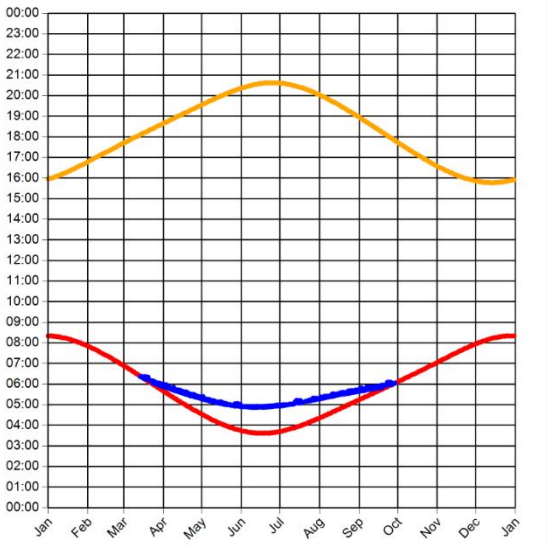


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



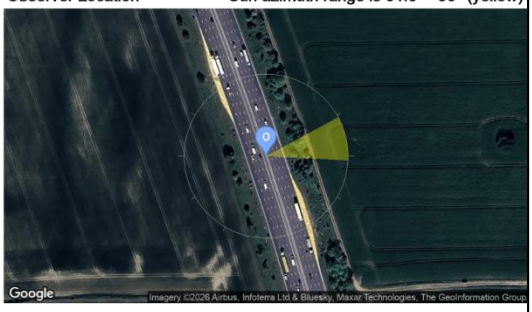
Observer D2 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.2°
Max observer difference angle: 11.4°

Observer Location — Sun azimuth range is 61.6° - 93° (yellow)

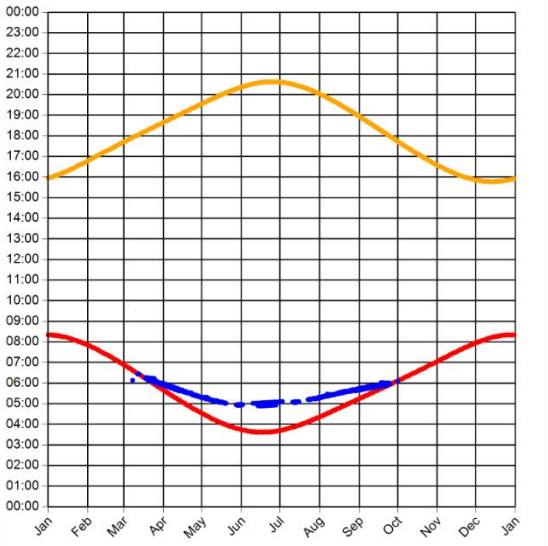


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



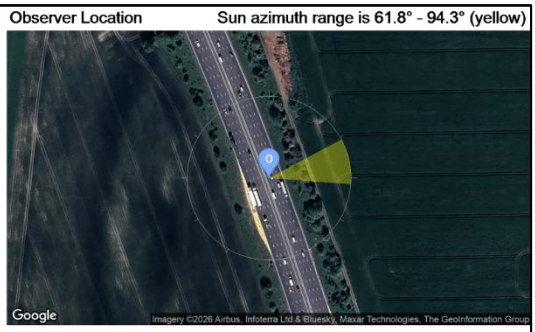
Observer D3 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.2°
Max observer difference angle: 12.5°

Observer Location — Sun azimuth range is 61.8° - 94.3° (yellow)

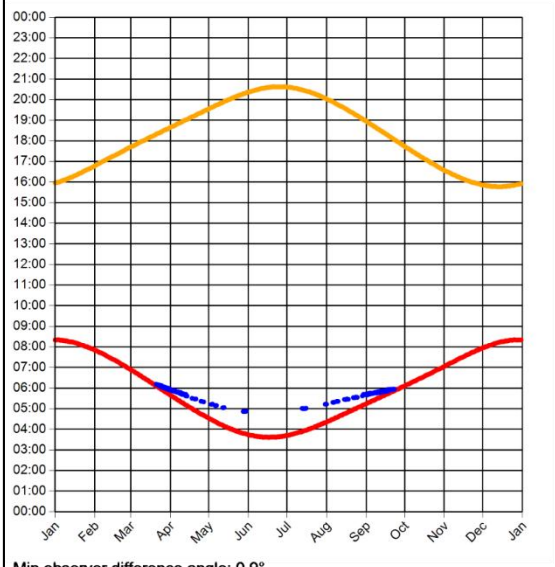


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



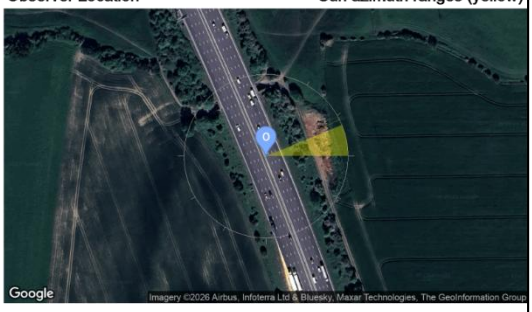
Observer D4 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.9°
Max observer difference angle: 8°

Observer Location — Sun azimuth ranges (yellow)

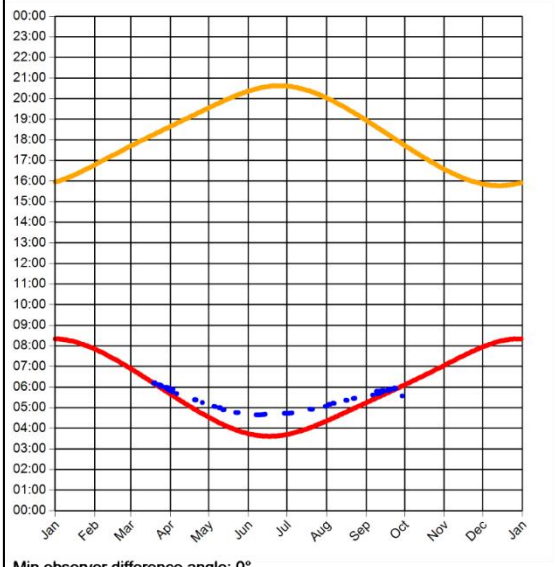


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



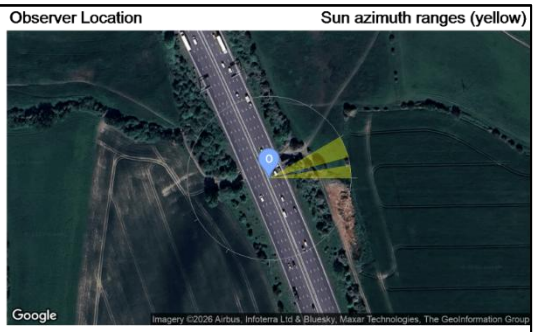
Observer D5 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 5.7°

Observer Location — Sun azimuth ranges (yellow)

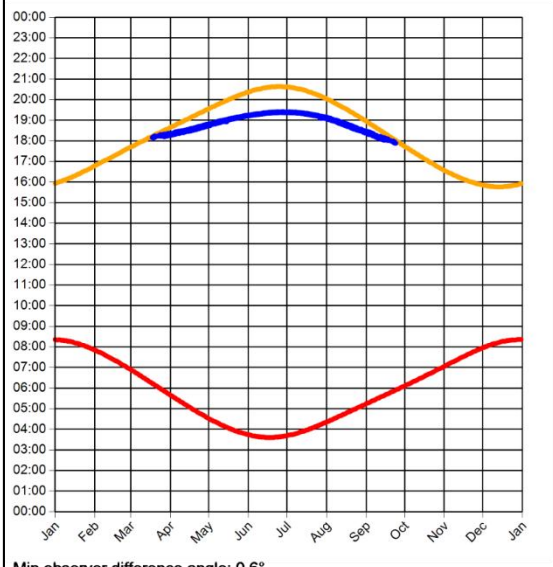


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



Observer E1 Results

Reflection Date/Time (GMT) Graph



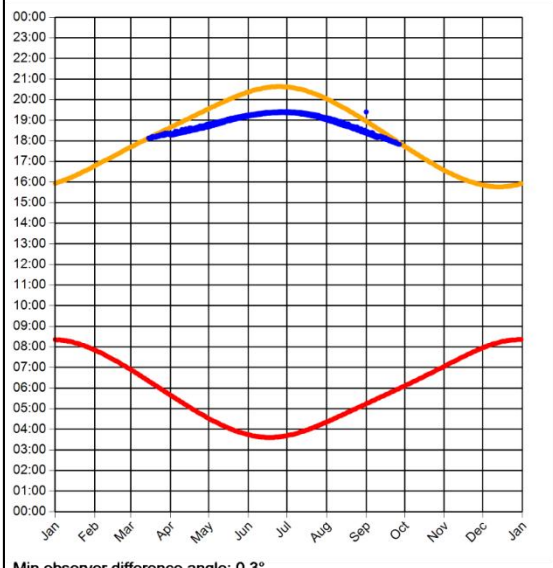
Min observer difference angle: 0.6°
Max observer difference angle: 8.9°

Observer Location — Sun azimuth range is 268.9° - 299° (yellow)



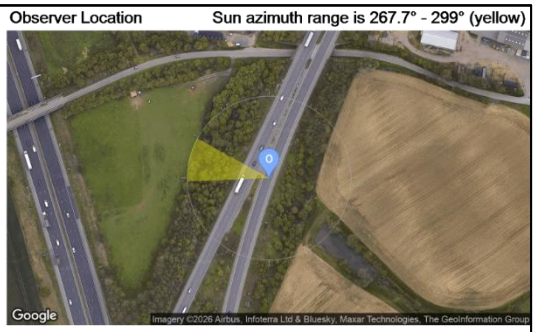
Observer E2 Results

Reflection Date/Time (GMT) Graph



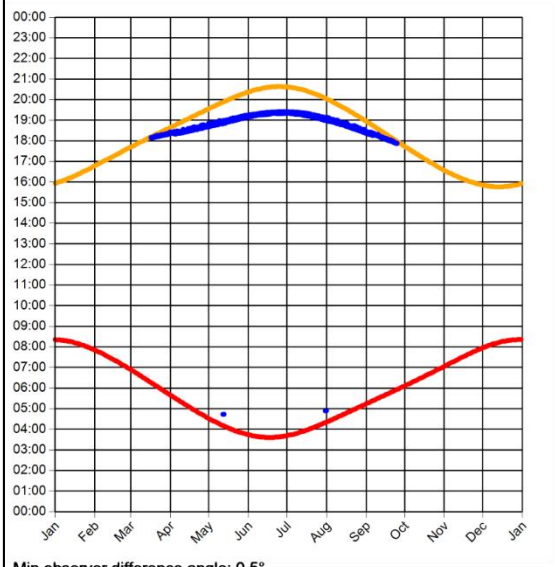
Min observer difference angle: 0.3°
Max observer difference angle: 8.9°

Observer Location — Sun azimuth range is 267.7° - 299° (yellow)



Observer E3 Results

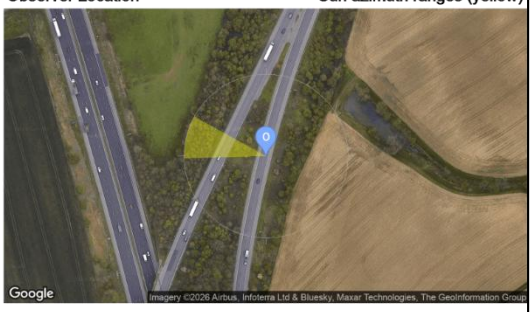
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.5°
Max observer difference angle: 9.7°

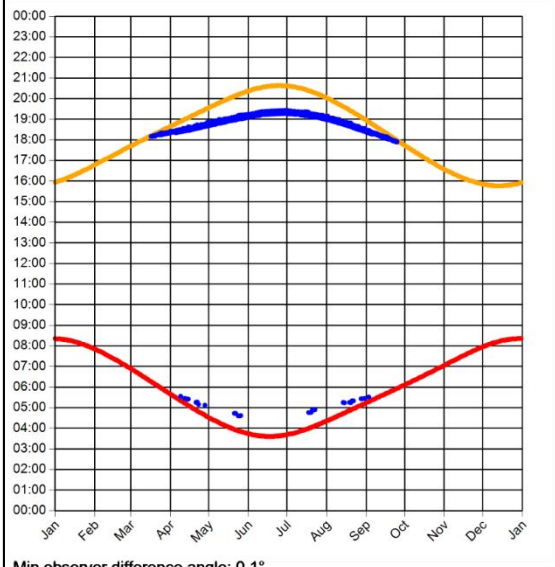
Observer Location

Sun azimuth ranges (yellow)



Observer E4 Results

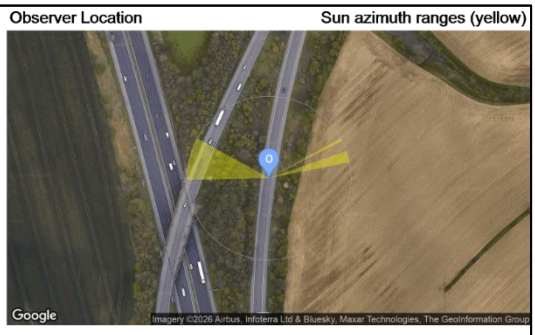
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.1°
Max observer difference angle: 10.6°

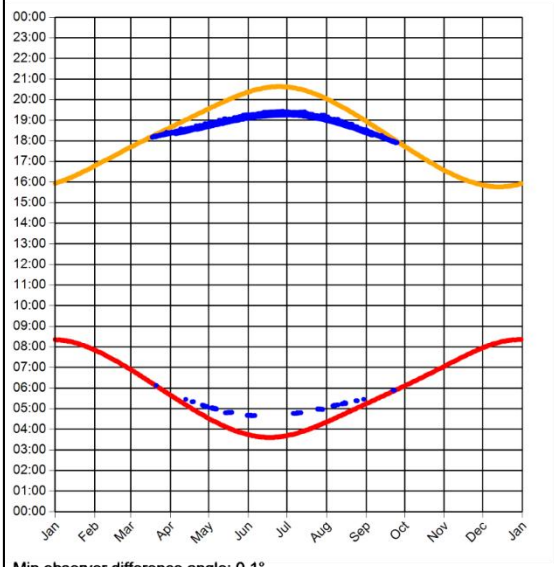
Observer Location

Sun azimuth ranges (yellow)



Observer E5 Results

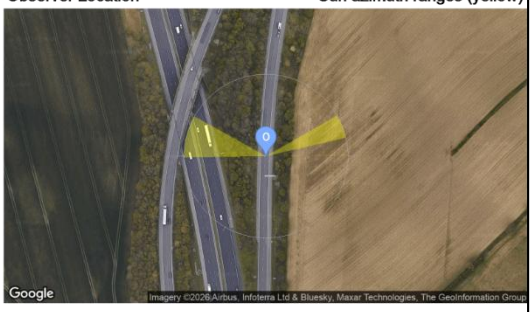
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.1°
Max observer difference angle: 11.1°

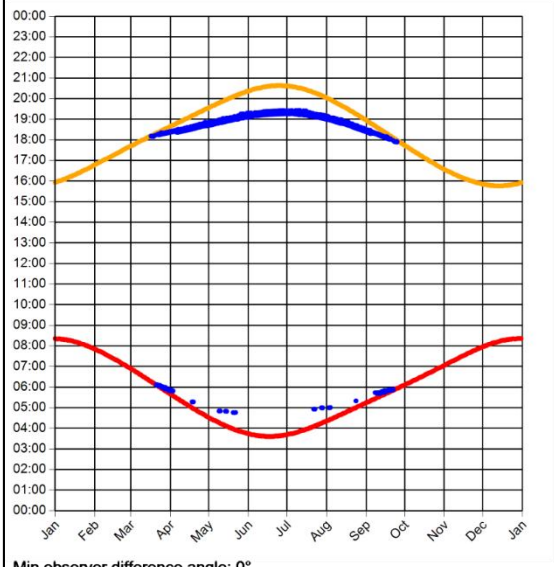
Observer Location

Sun azimuth ranges (yellow)



Observer E6 Results

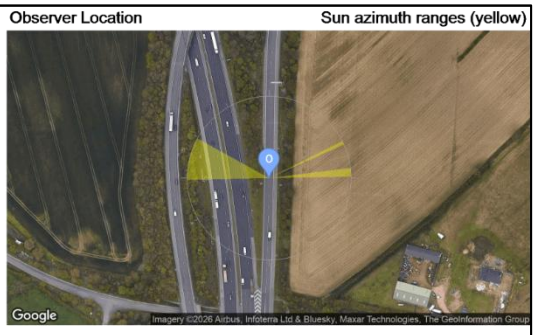
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 10.9°

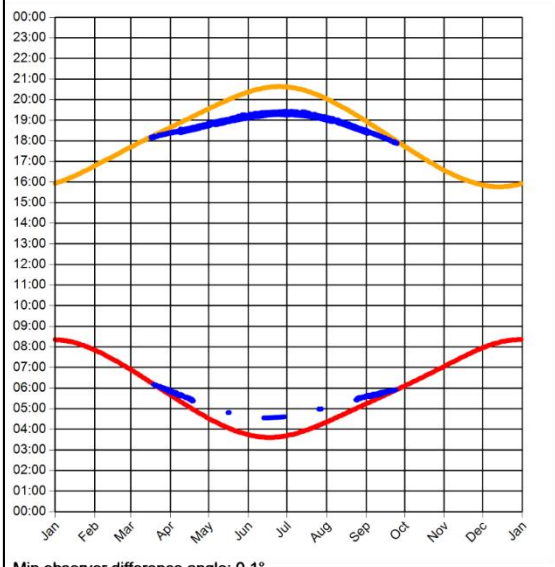
Observer Location

Sun azimuth ranges (yellow)



Observer E7 Results

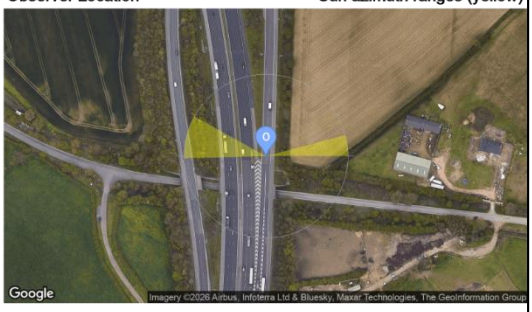
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.1°
Max observer difference angle: 10.6°

Observer Location

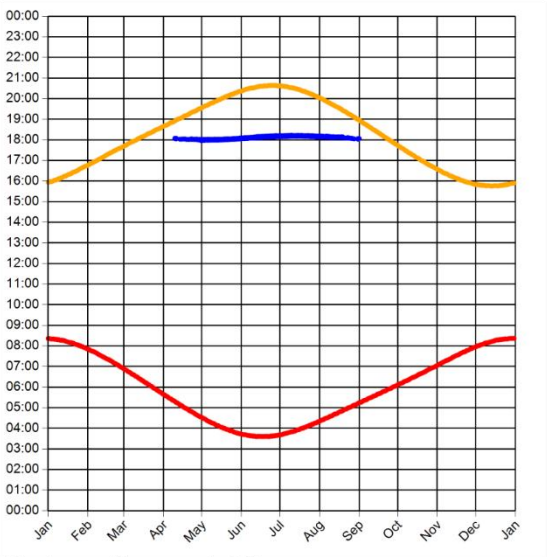
Sun azimuth ranges (yellow)



Panel tilt: 25 degrees

Observer A1 Results

Reflection Date/Time (GMT) Graph



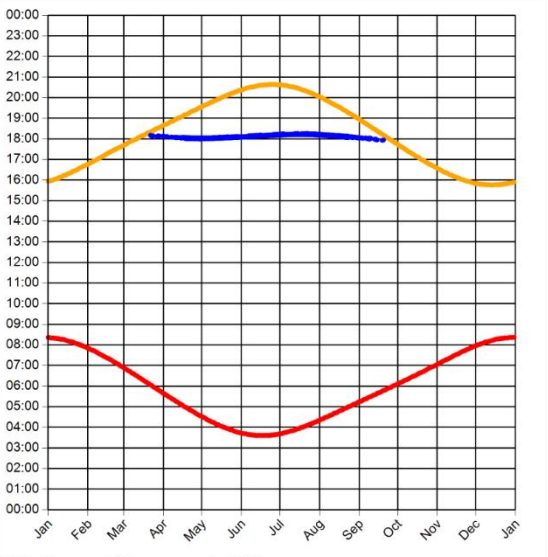
Min observer difference angle: 8.3°
Max observer difference angle: 21.2°

Observer Location — Sun azimuth range is 274.4° - 285.3° (yellow)



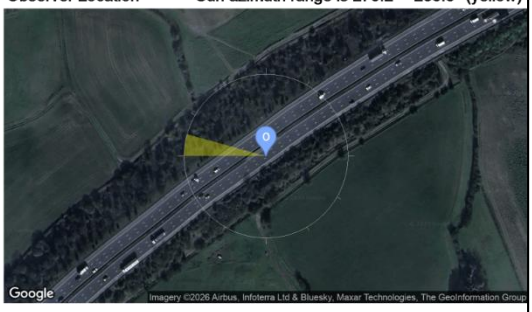
Observer A2 Results

Reflection Date/Time (GMT) Graph



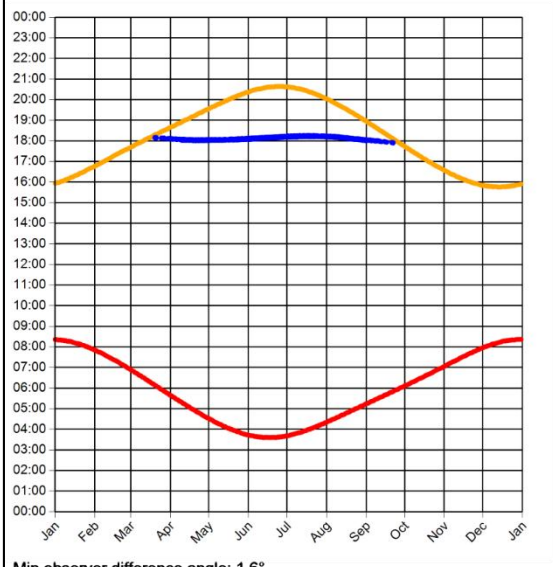
Min observer difference angle: 1.9°
Max observer difference angle: 20.7°

Observer Location — Sun azimuth range is 270.2° - 285.5° (yellow)



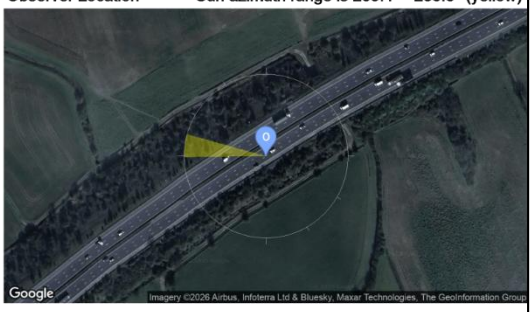
Observer A3 Results

Reflection Date/Time (GMT) Graph



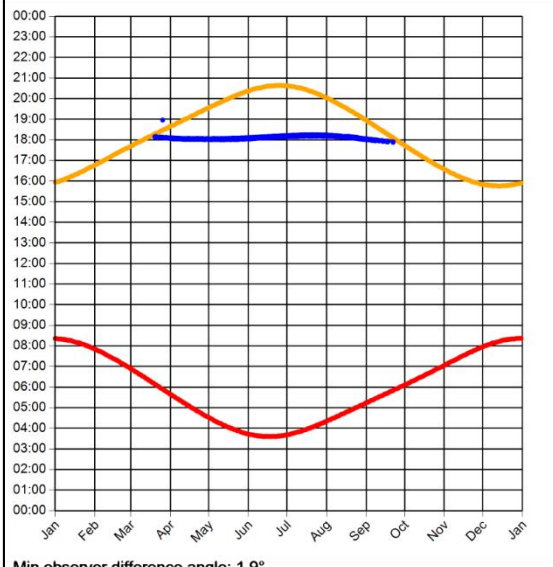
Min observer difference angle: 1.6°
Max observer difference angle: 21°

Observer Location — Sun azimuth range is 269.4° - 285.5° (yellow)



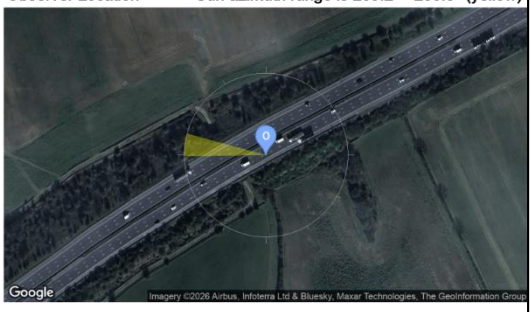
Observer A4 Results

Reflection Date/Time (GMT) Graph



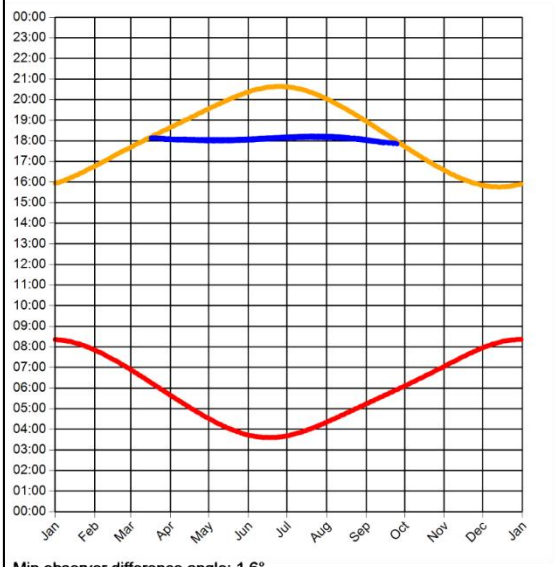
Min observer difference angle: 1.9°
Max observer difference angle: 21.6°

Observer Location — Sun azimuth range is 269.2° - 285.3° (yellow)



Observer A5 Results

Reflection Date/Time (GMT) Graph



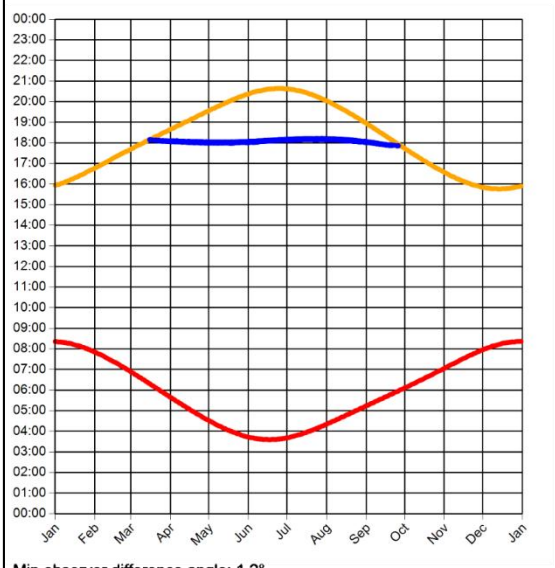
Min observer difference angle: 1.6°
Max observer difference angle: 21.7°

Observer Location — Sun azimuth range is 268.3° - 285° (yellow)



Observer A6 Results

Reflection Date/Time (GMT) Graph



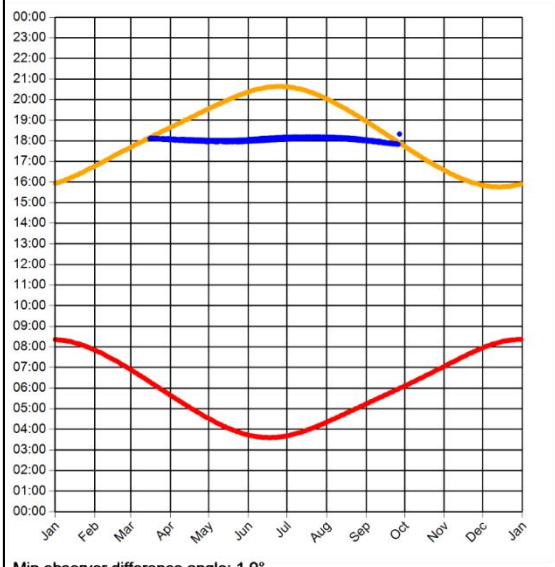
Min observer difference angle: 1.2°
Max observer difference angle: 22.1°

Observer Location — Sun azimuth range is 268.1° - 284.9° (yellow)



Observer A7 Results

Reflection Date/Time (GMT) Graph



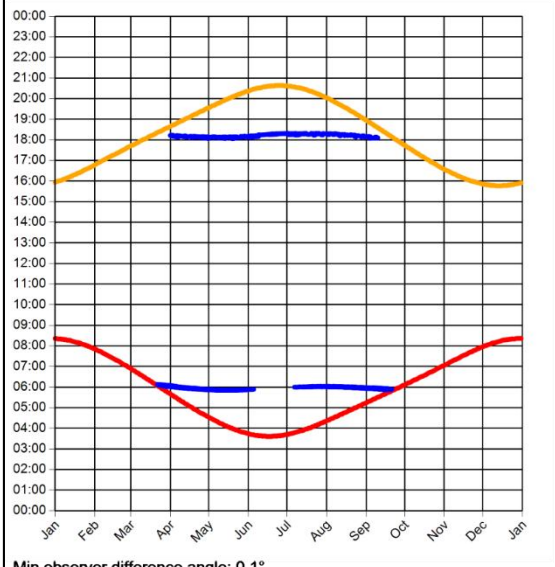
Observer Location — Sun azimuth range is 267.8° - 285° (yellow)



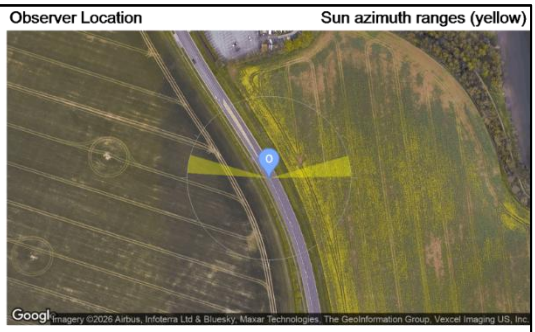
Min observer difference angle: 1.9°
Max observer difference angle: 23.2°

Observer B1 Results

Reflection Date/Time (GMT) Graph



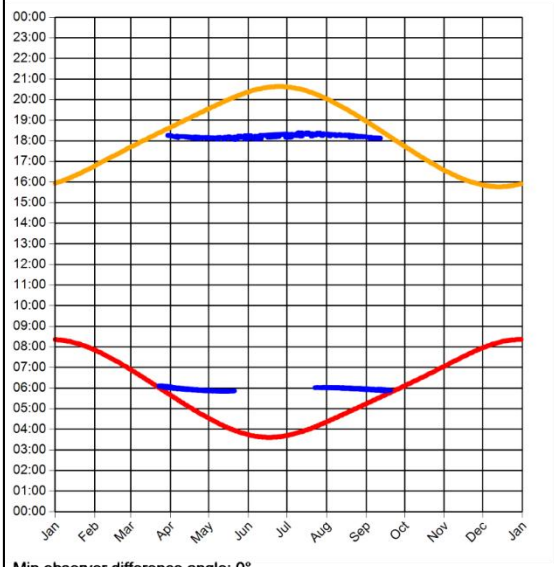
Observer Location — Sun azimuth ranges (yellow)



Min observer difference angle: 0.1°
Max observer difference angle: 19.2°

Observer B2 Results

Reflection Date/Time (GMT) Graph



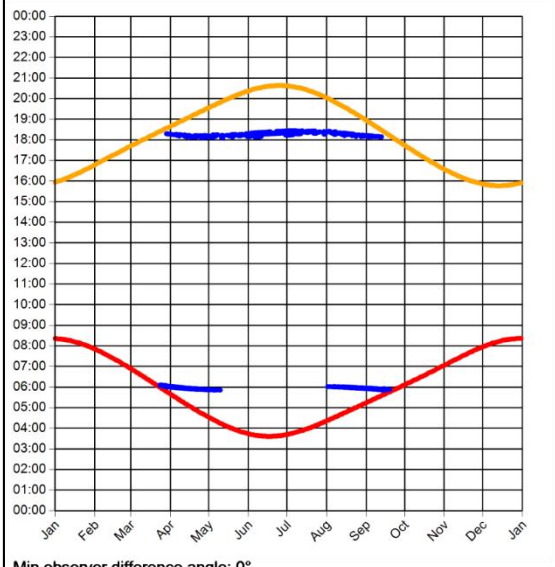
Observer Location | Sun azimuth ranges (yellow)



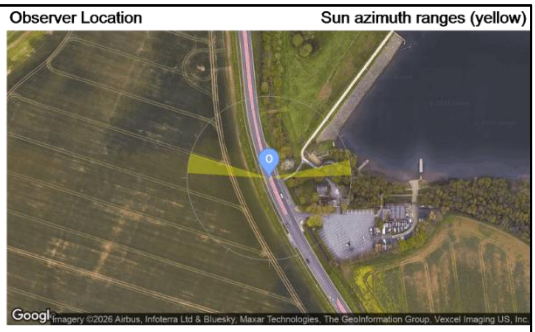
Min observer difference angle: 0°
Max observer difference angle: 20.6°

Observer B3 Results

Reflection Date/Time (GMT) Graph



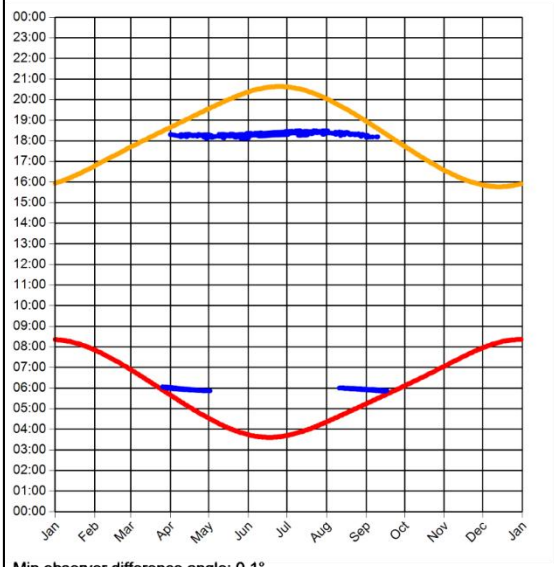
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 19.5°

Observer B4 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.1°
Max observer difference angle: 18.2°

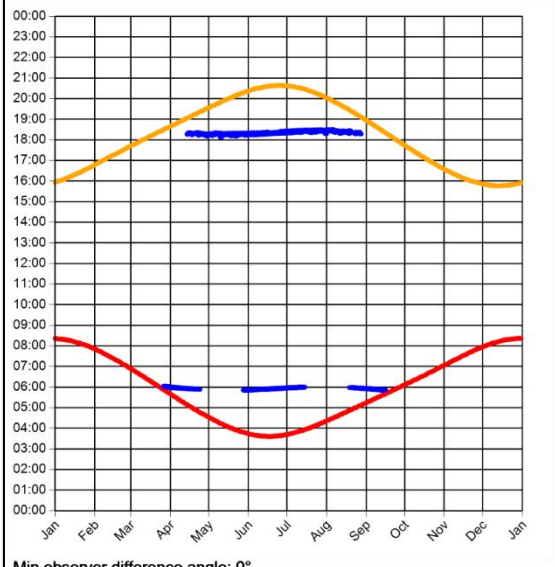
Observer Location

Sun azimuth ranges (yellow)



Observer B5 Results

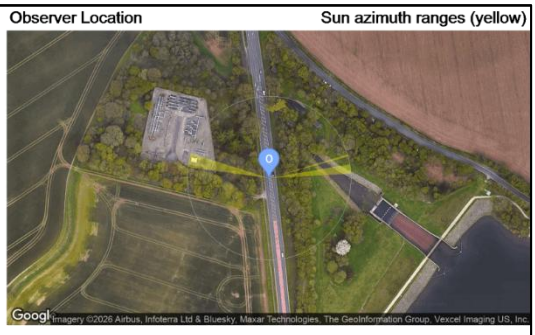
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0°
Max observer difference angle: 17.5°

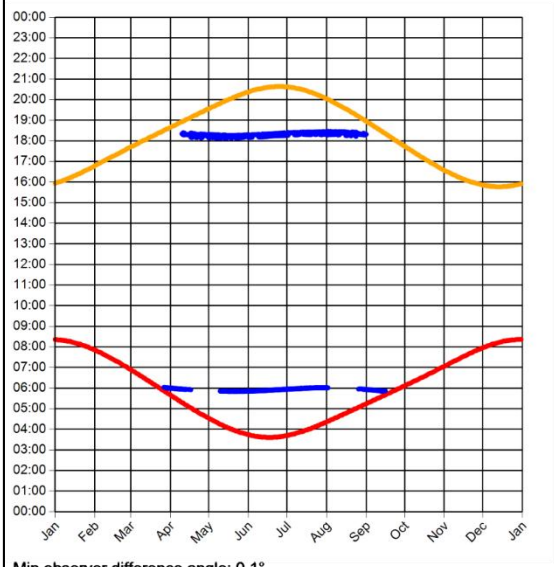
Observer Location

Sun azimuth ranges (yellow)



Observer B6 Results

Reflection Date/Time (GMT) Graph



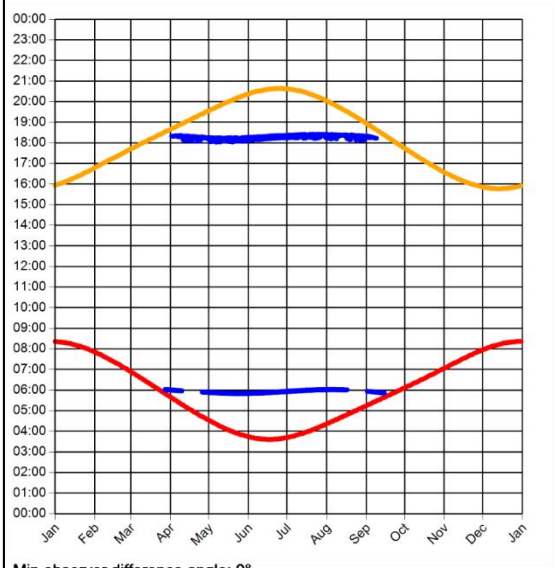
Observer Location | Sun azimuth ranges (yellow)



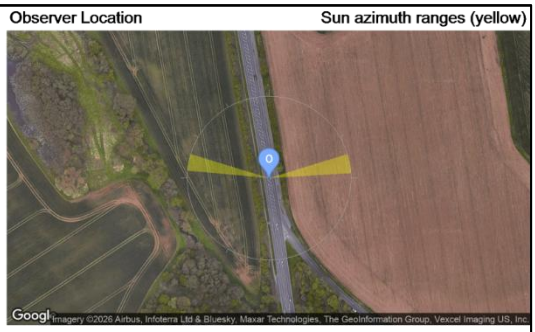
Min observer difference angle: 0.1°
Max observer difference angle: 18.8°

Observer B7 Results

Reflection Date/Time (GMT) Graph



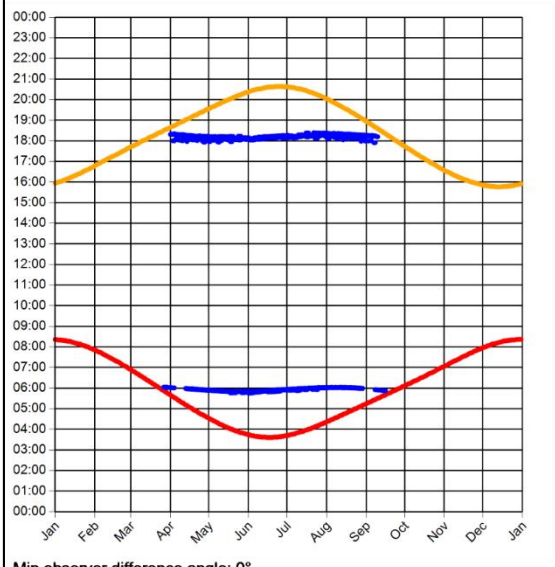
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 19.2°

Observer B8 Results

Reflection Date/Time (GMT) Graph



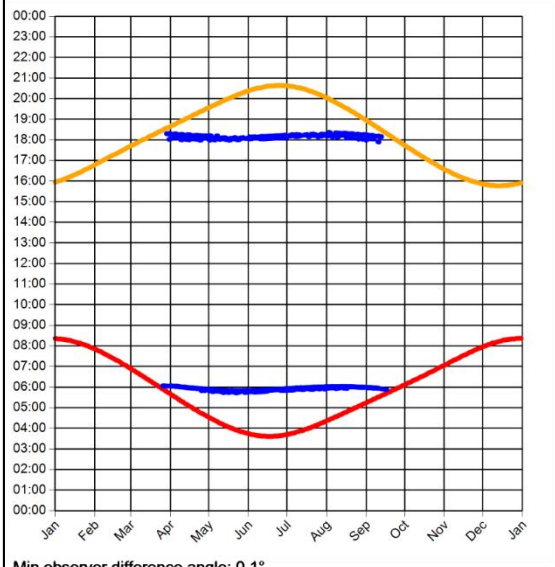
Observer Location | Sun azimuth ranges (yellow)



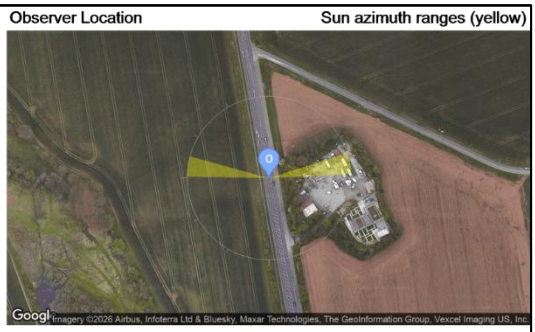
Min observer difference angle: 0°
Max observer difference angle: 21.4°

Observer B9 Results

Reflection Date/Time (GMT) Graph



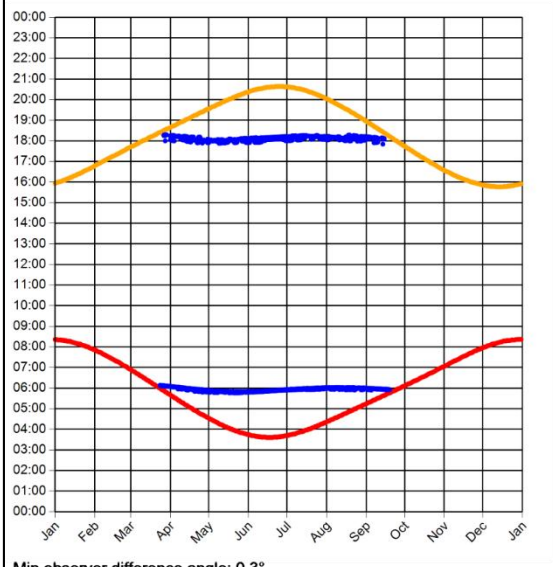
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0.1°
Max observer difference angle: 22.6°

Observer B10 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.3°
Max observer difference angle: 24.8°

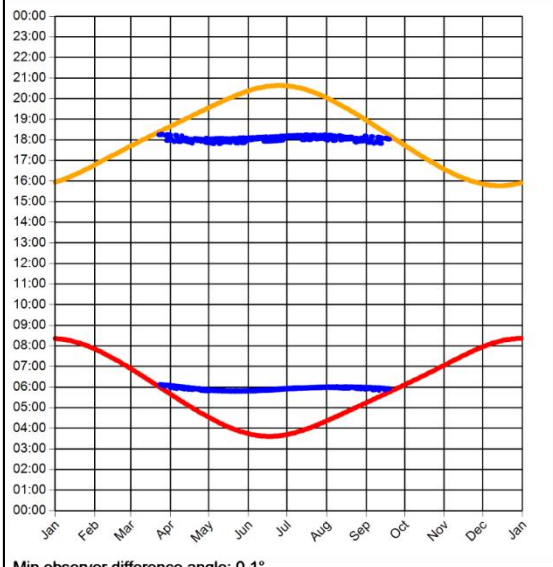
Observer Location

Sun azimuth ranges (yellow)



Observer B11 Results

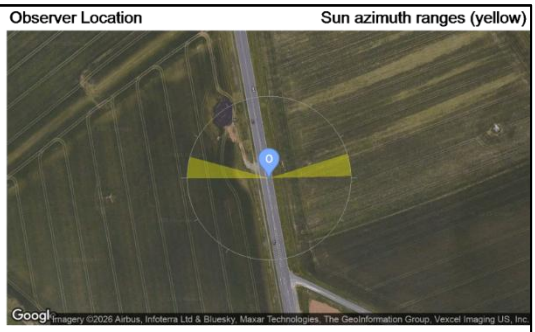
Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.1°
Max observer difference angle: 26°

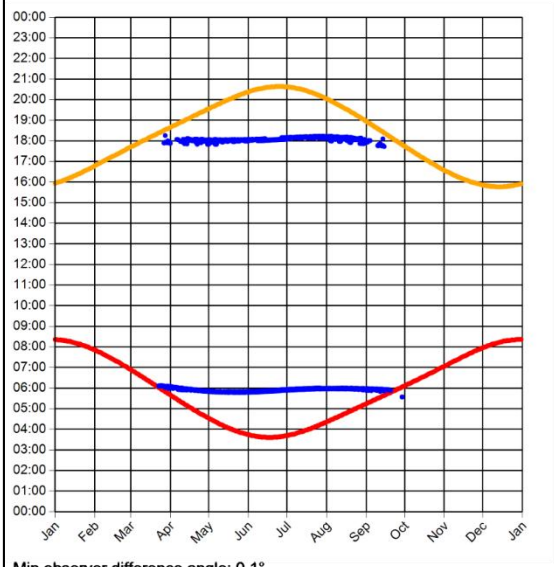
Observer Location

Sun azimuth ranges (yellow)

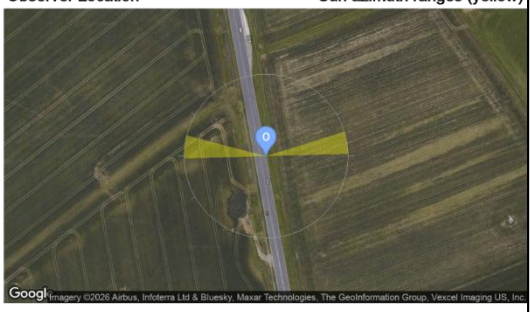


Observer B12 Results

Reflection Date/Time (GMT) Graph



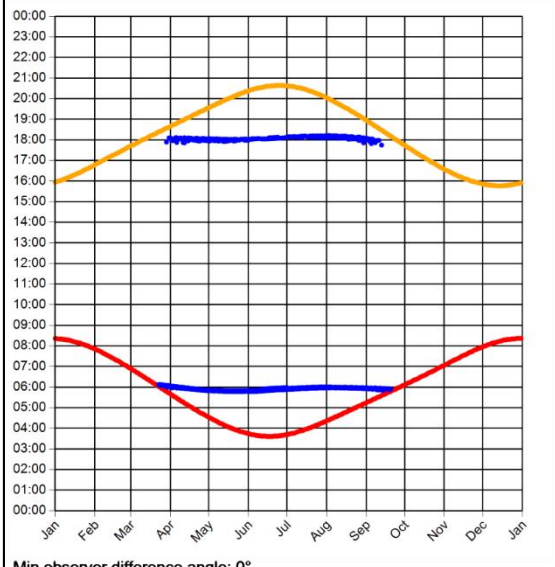
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0.1°
Max observer difference angle: 23.4°

Observer B13 Results

Reflection Date/Time (GMT) Graph



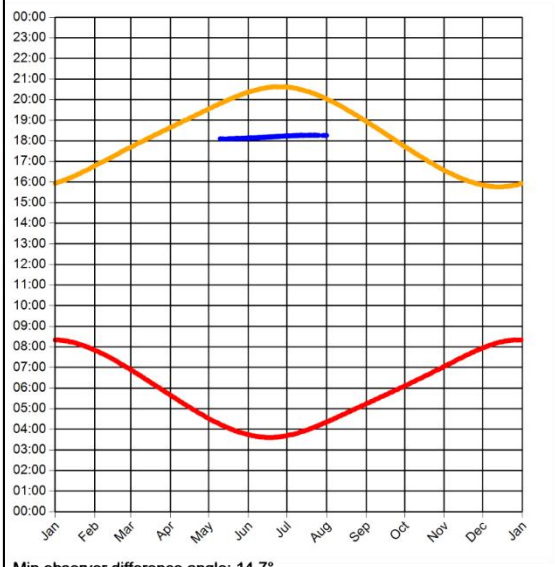
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0°
Max observer difference angle: 22.8°

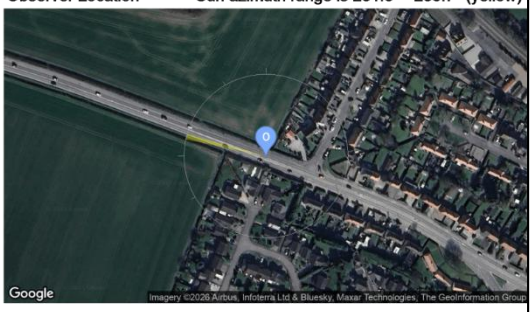
Observer C1 Results

Reflection Date/Time (GMT) Graph



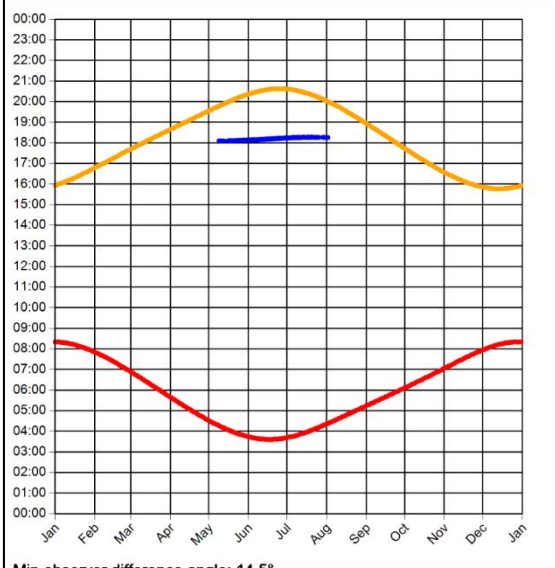
Min observer difference angle: 14.7°
Max observer difference angle: 19.5°

Observer Location — Sun azimuth range is 281.8° - 285.7° (yellow)



Observer C2 Results

Reflection Date/Time (GMT) Graph



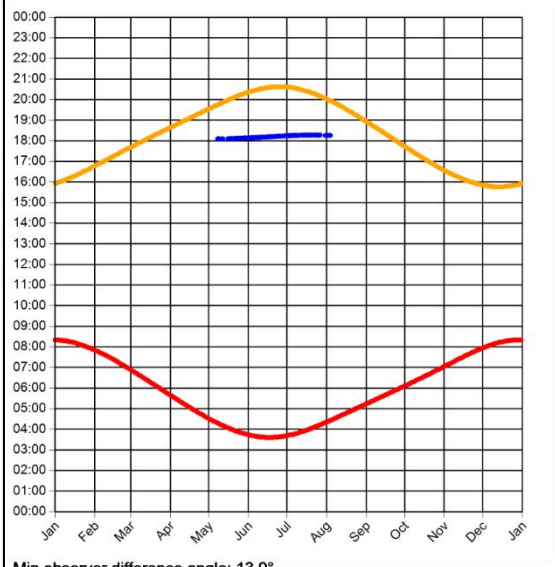
Min observer difference angle: 14.5°
Max observer difference angle: 19.5°

Observer Location — Sun azimuth range is 281.6° - 285.7° (yellow)

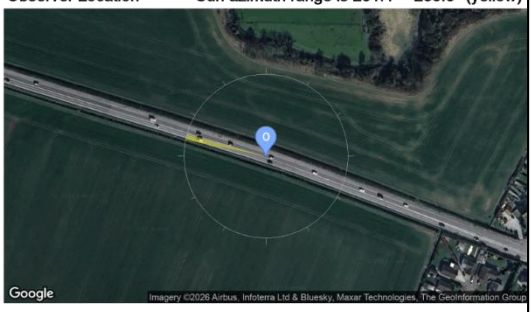


Observer C3 Results

Reflection Date/Time (GMT) Graph



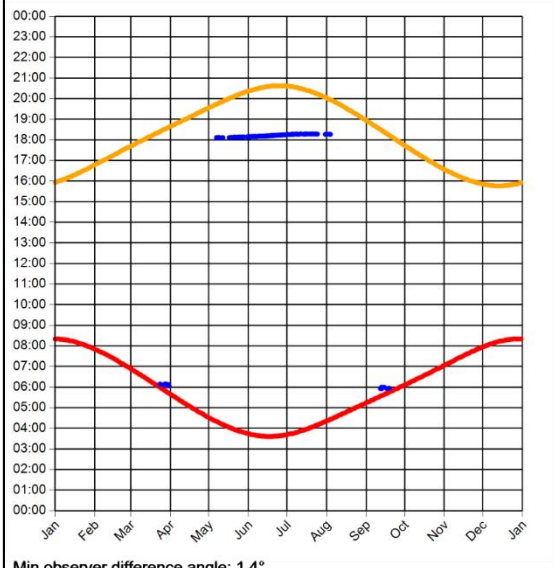
Observer Location — Sun azimuth range is 281.4° - 285.8° (yellow)



Min observer difference angle: 13.9°
Max observer difference angle: 19.2°

Observer C4 Results

Reflection Date/Time (GMT) Graph



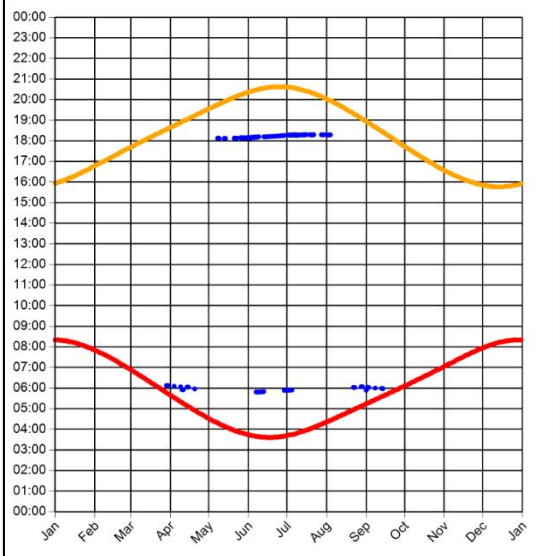
Observer Location — Sun azimuth ranges (yellow)



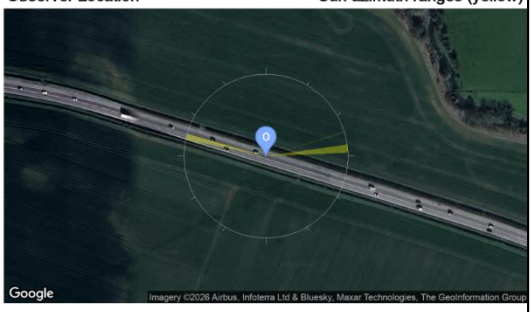
Min observer difference angle: 1.4°
Max observer difference angle: 19.2°

Observer C5 Results

Reflection Date/Time (GMT) Graph



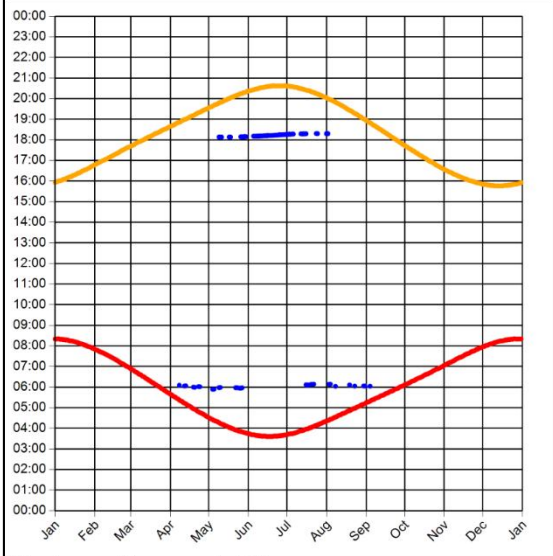
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 3.1°
Max observer difference angle: 18.9°

Observer C6 Results

Reflection Date/Time (GMT) Graph



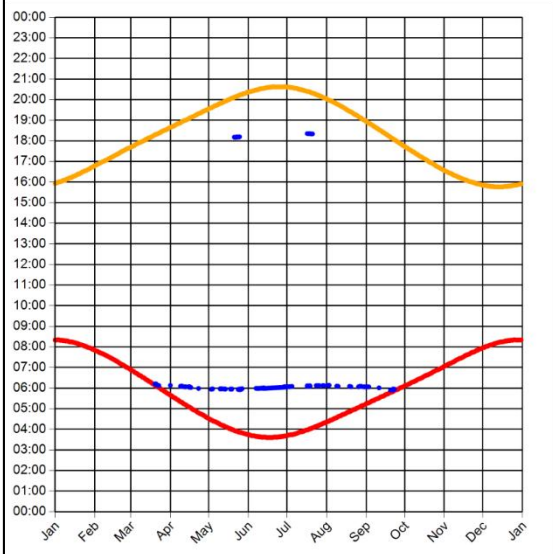
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 6.7°
Max observer difference angle: 19°

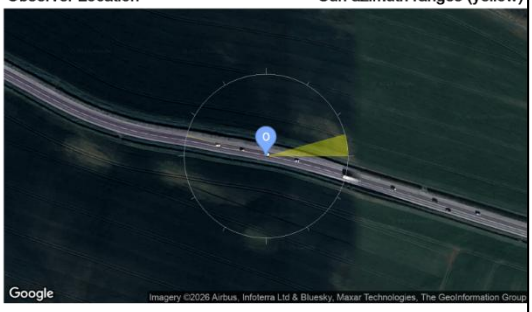
Observer C7 Results

Reflection Date/Time (GMT) Graph



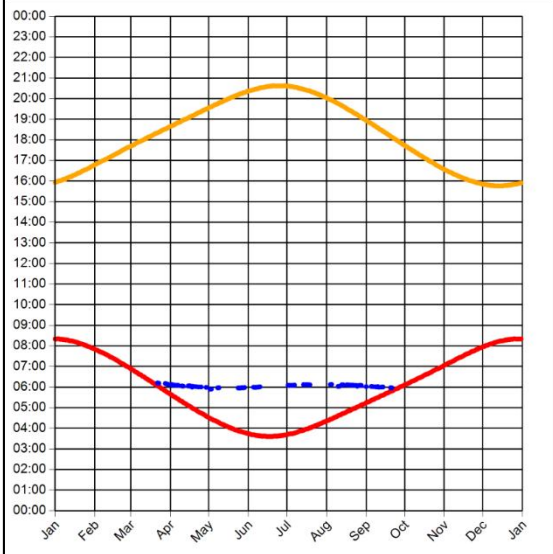
Min observer difference angle: 0.2°
Max observer difference angle: 20°

Observer Location — Sun azimuth ranges (yellow)



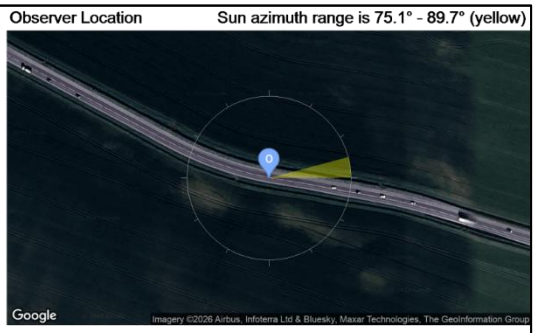
Observer C8 Results

Reflection Date/Time (GMT) Graph



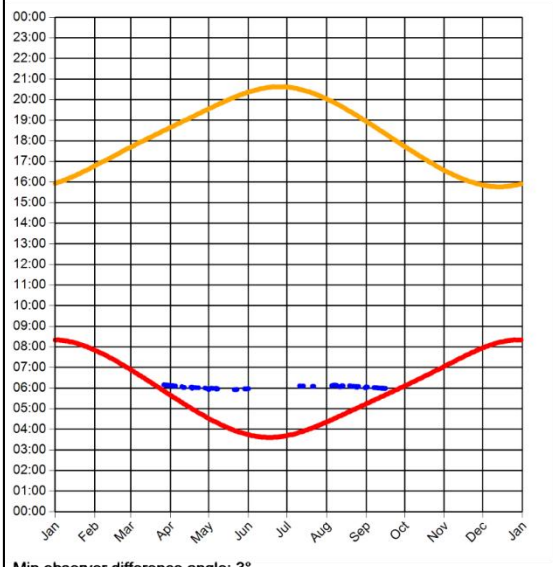
Min observer difference angle: 1.6°
Max observer difference angle: 20.1°

Observer Location — Sun azimuth range is 75.1° - 89.7° (yellow)

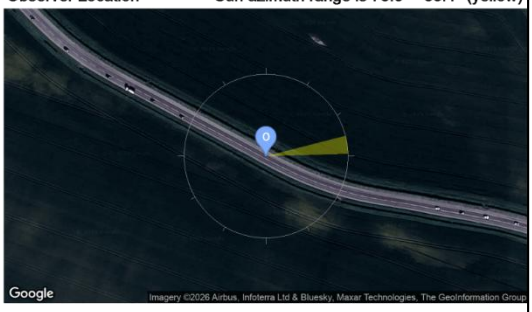


Observer C9 Results

Reflection Date/Time (GMT) Graph



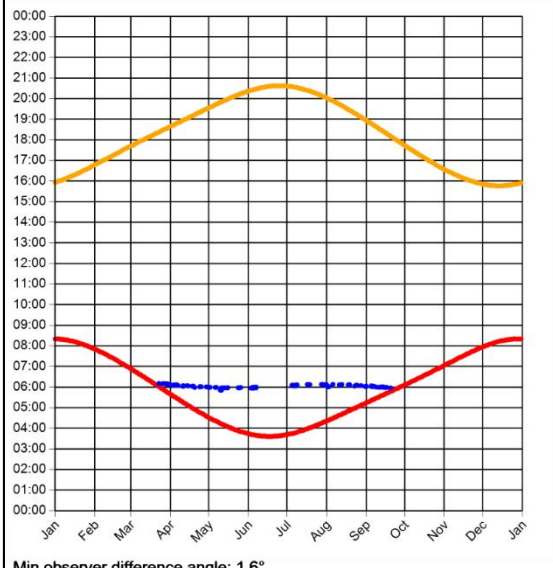
Observer Location — Sun azimuth range is 75.6° - 88.4° (yellow)



Min observer difference angle: 3°
Max observer difference angle: 19°

Observer C10 Results

Reflection Date/Time (GMT) Graph



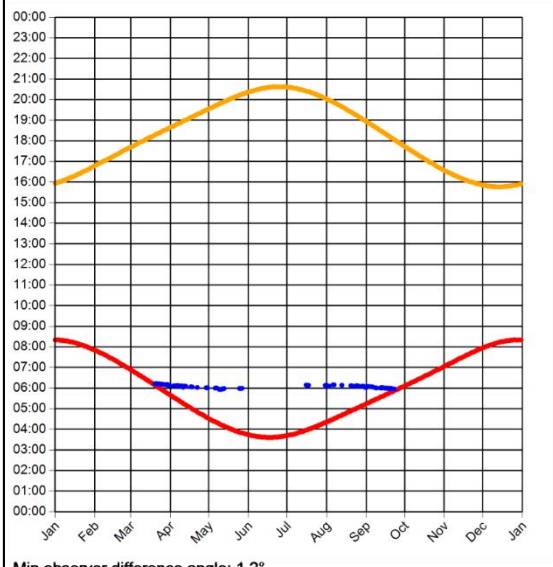
Observer Location — Sun azimuth range is 74.9° - 89.2° (yellow)



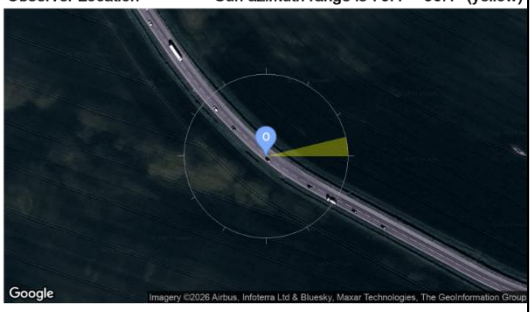
Min observer difference angle: 1.6°
Max observer difference angle: 19.9°

Observer C11 Results

Reflection Date/Time (GMT) Graph



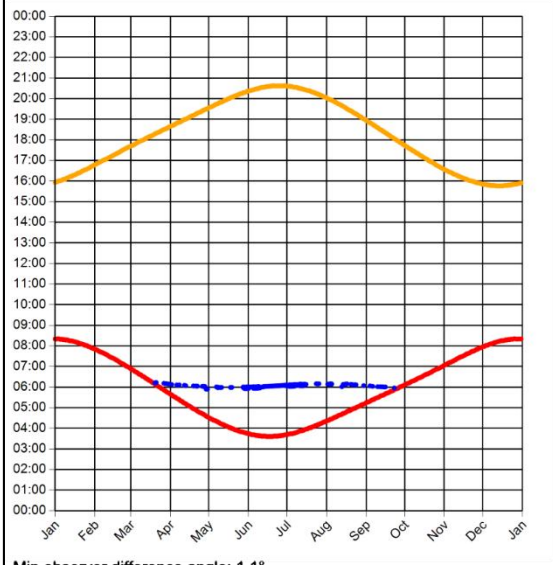
Observer Location — Sun azimuth range is 76.4° - 90.1° (yellow)



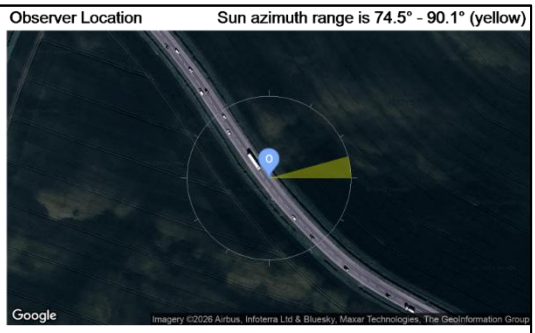
Min observer difference angle: 1.2°
Max observer difference angle: 19.1°

Observer C12 Results

Reflection Date/Time (GMT) Graph



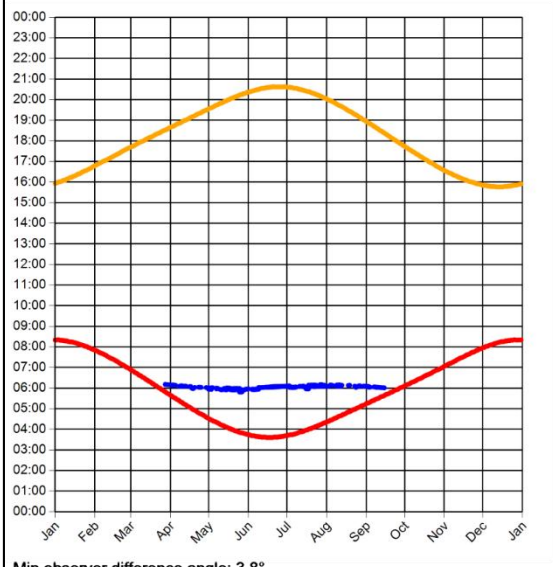
Observer Location — Sun azimuth range is 74.5° - 90.1° (yellow)



Min observer difference angle: 1.1°
Max observer difference angle: 20.8°

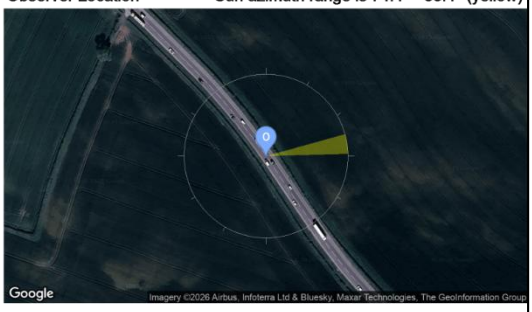
Observer C13 Results

Reflection Date/Time (GMT) Graph



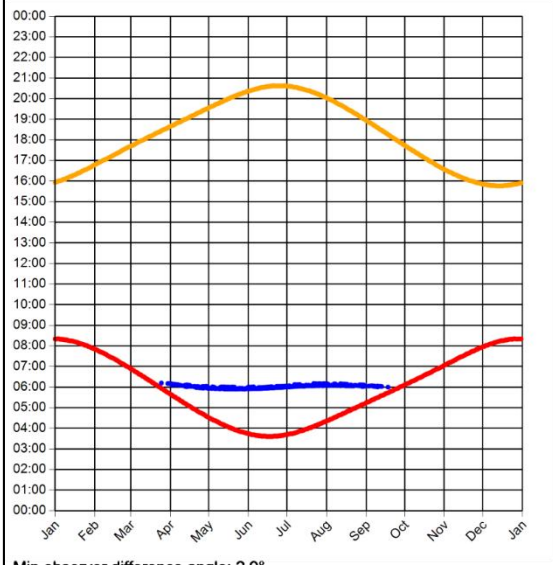
Min observer difference angle: 3.8°
Max observer difference angle: 21°

Observer Location — Sun azimuth range is 74.4° - 88.4° (yellow)



Observer C14 Results

Reflection Date/Time (GMT) Graph



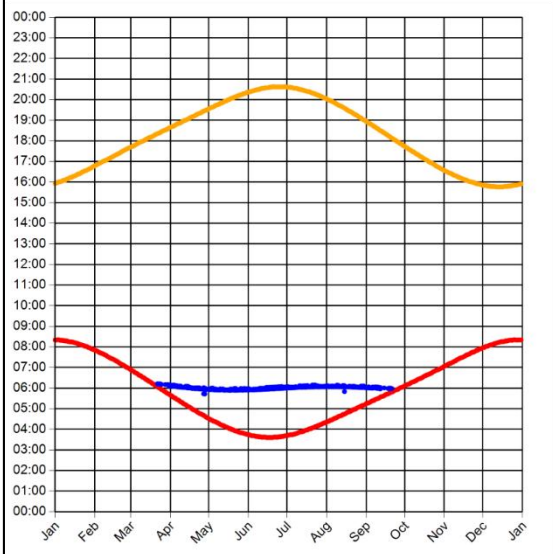
Min observer difference angle: 2.9°
Max observer difference angle: 20.1°

Observer Location — Sun azimuth range is 73.9° - 89.1° (yellow)

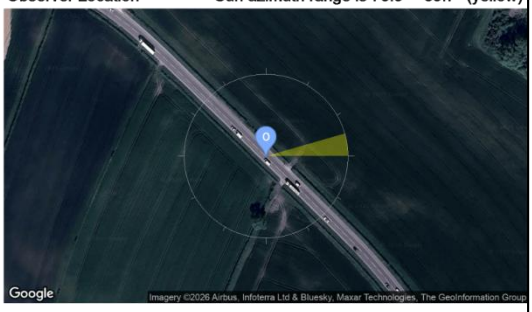


Observer C15 Results

Reflection Date/Time (GMT) Graph



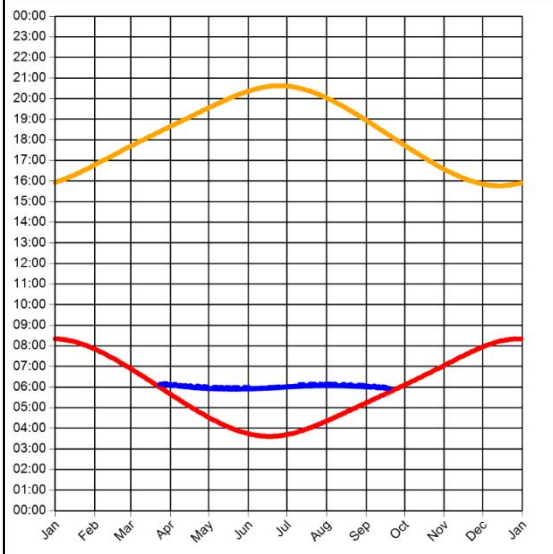
Observer Location — Sun azimuth range is 73.9° - 89.7° (yellow)



Min observer difference angle: 1.9°
Max observer difference angle: 20.7°

Observer C16 Results

Reflection Date/Time (GMT) Graph



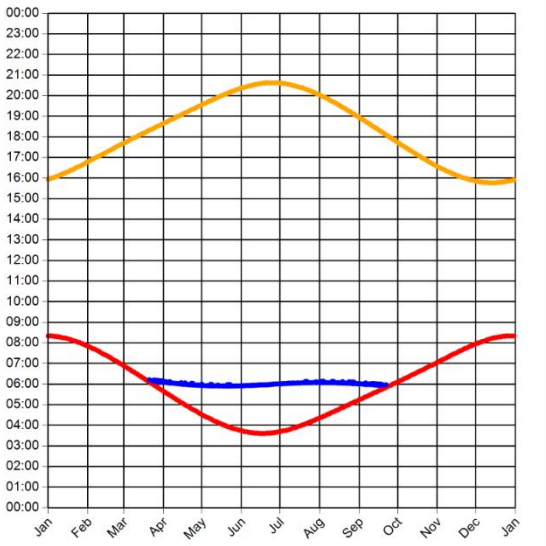
Observer Location — Sun azimuth range is 73.8° - 88.7° (yellow)



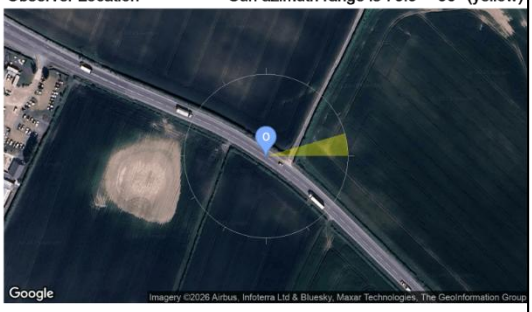
Min observer difference angle: 1.2°
Max observer difference angle: 19.6°

Observer C17 Results

Reflection Date/Time (GMT) Graph



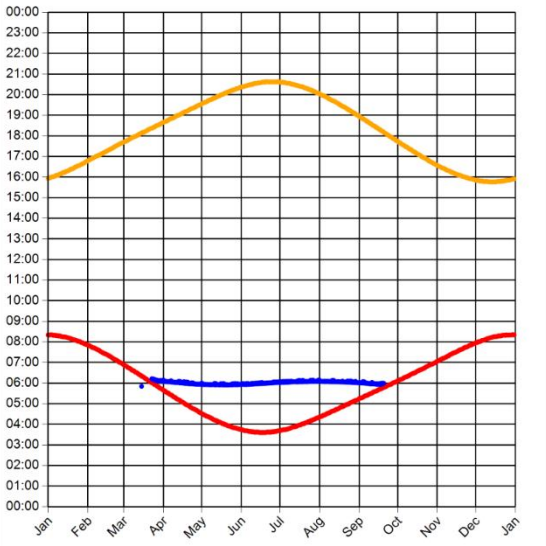
Observer Location — Sun azimuth range is 73.9° - 90° (yellow)



Min observer difference angle: 1.2°
Max observer difference angle: 18.9°

Observer C18 Results

Reflection Date/Time (GMT) Graph



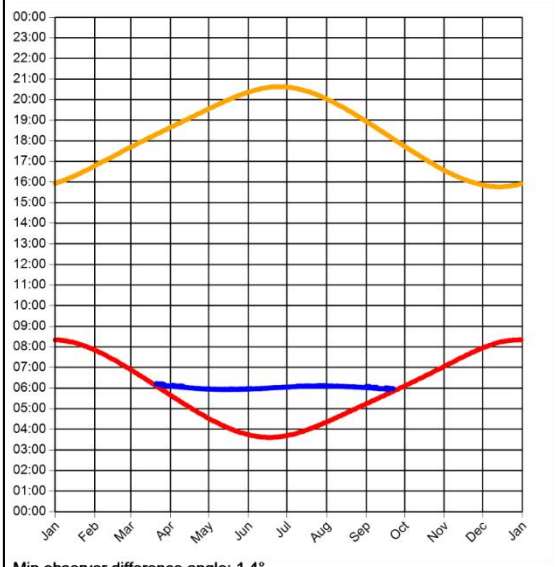
Observer Location — Sun azimuth range is 74.2° - 89.6° (yellow)



Min observer difference angle: 1.6°
Max observer difference angle: 20.1°

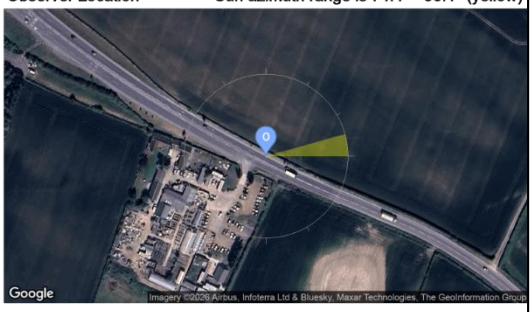
Observer C19 Results

Reflection Date/Time (GMT) Graph



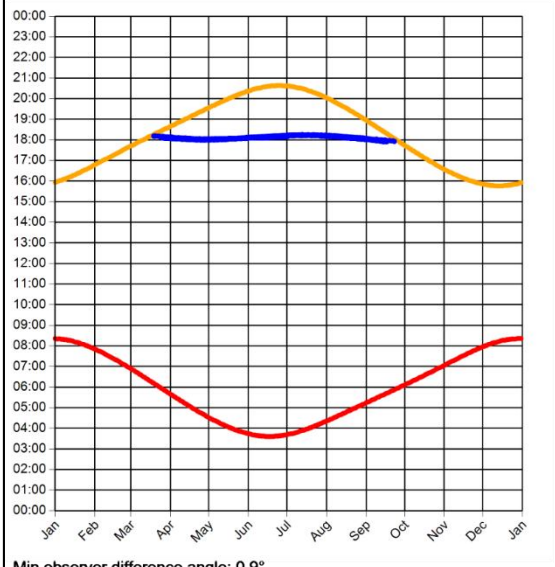
Min observer difference angle: 1.4°
Max observer difference angle: 19.7°

Observer Location — Sun azimuth range is 74.4° - 90.1° (yellow)



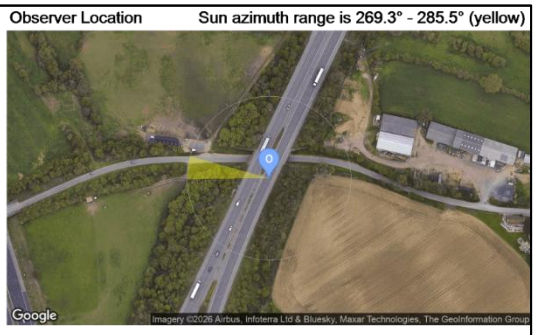
Observer E1 Results

Reflection Date/Time (GMT) Graph



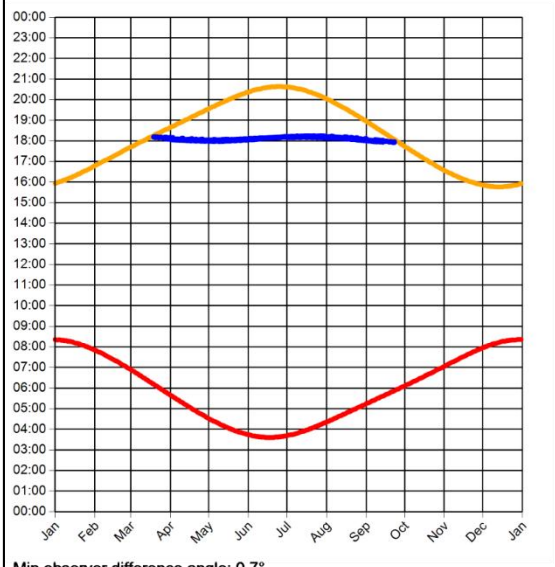
Min observer difference angle: 0.9°
Max observer difference angle: 21.6°

Observer Location — Sun azimuth range is 269.3° - 285.5° (yellow)



Observer E2 Results

Reflection Date/Time (GMT) Graph



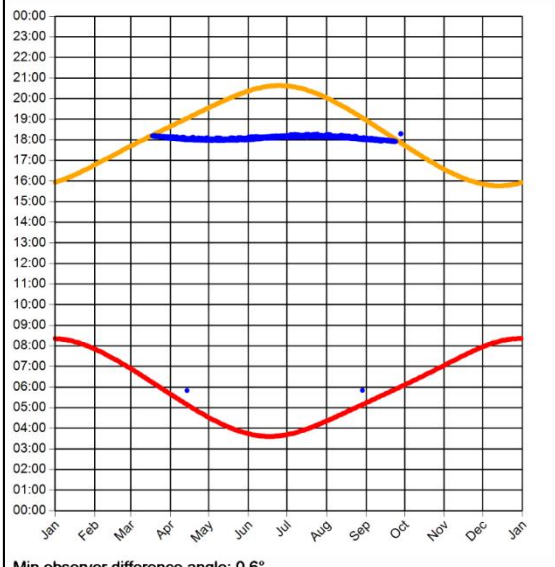
Min observer difference angle: 0.7°
Max observer difference angle: 21.2°

Observer Location — Sun azimuth range is 269.4° - 285.2° (yellow)



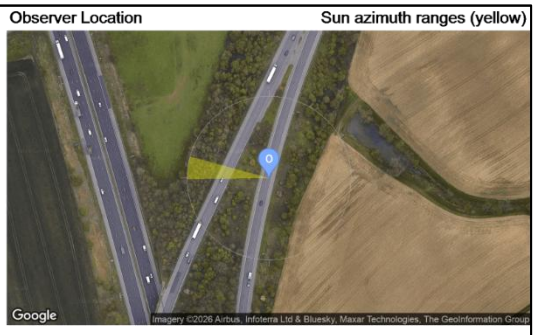
Observer E3 Results

Reflection Date/Time (GMT) Graph



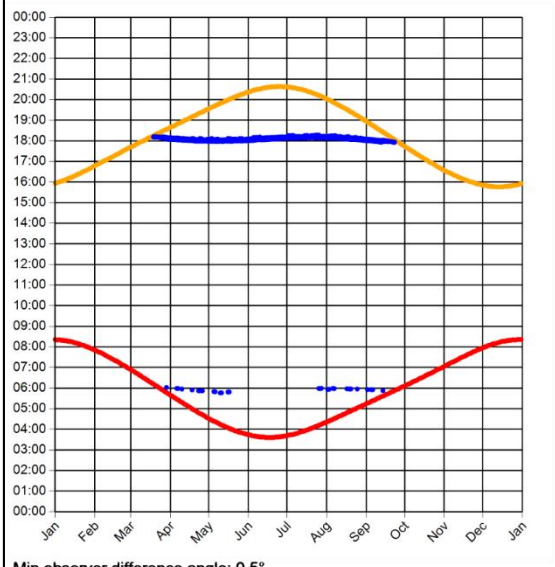
Min observer difference angle: 0.6°
Max observer difference angle: 22.4°

Observer Location — Sun azimuth ranges (yellow)

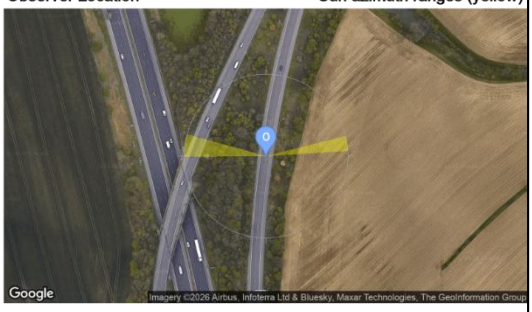


Observer E4 Results

Reflection Date/Time (GMT) Graph



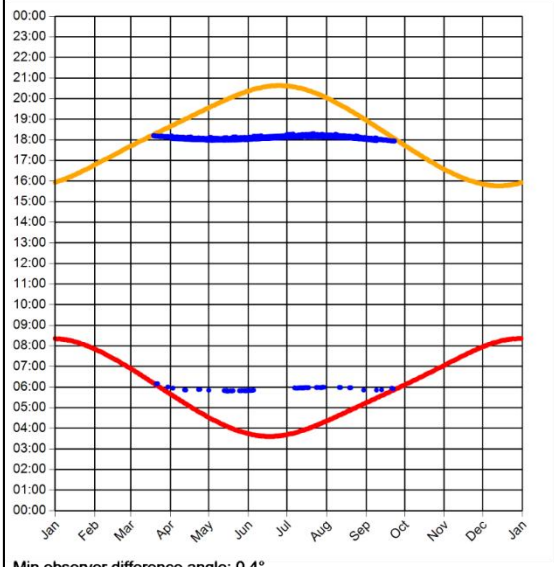
Observer Location | Sun azimuth ranges (yellow)



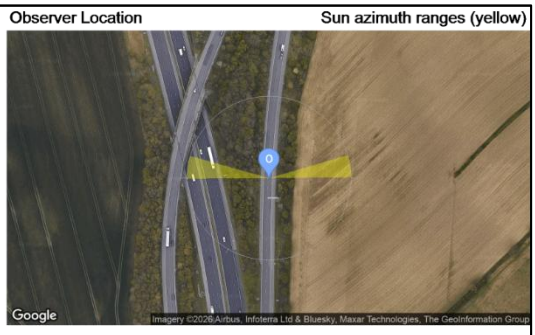
Min observer difference angle: 0.5°
Max observer difference angle: 22.3°

Observer E5 Results

Reflection Date/Time (GMT) Graph



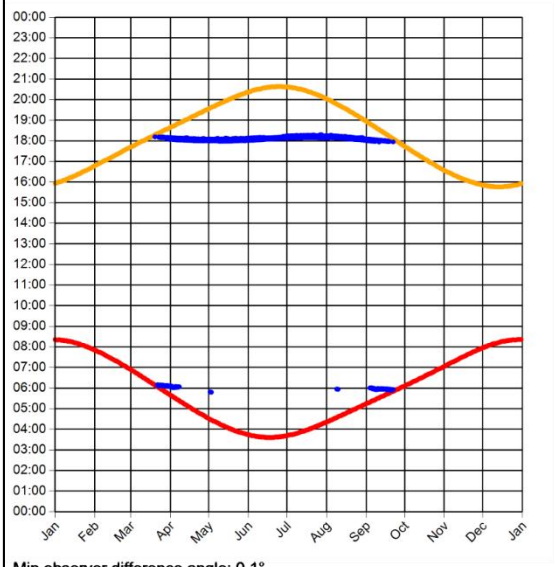
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 0.4°
Max observer difference angle: 22.5°

Observer E6 Results

Reflection Date/Time (GMT) Graph



Observer Location

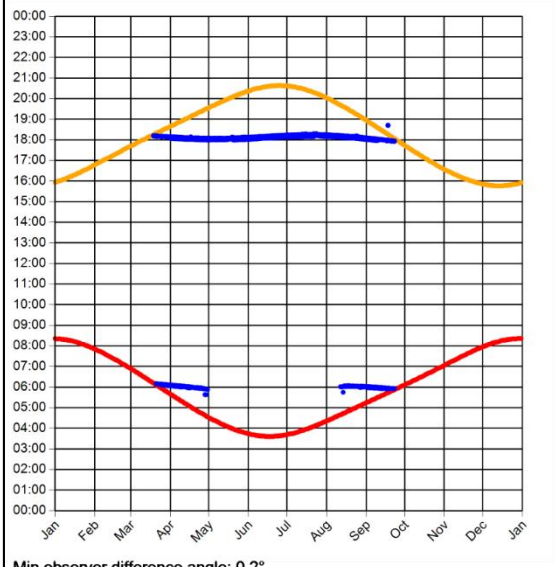
Sun azimuth ranges (yellow)



Min observer difference angle: 0.1°
Max observer difference angle: 22.2°

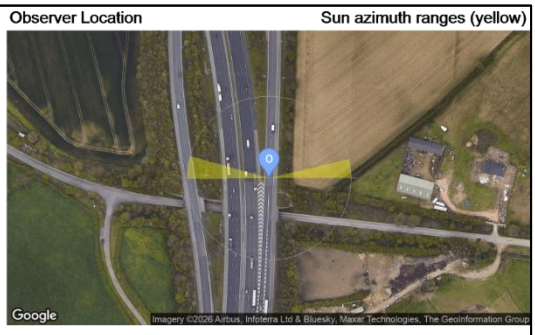
Observer E7 Results

Reflection Date/Time (GMT) Graph



Observer Location

Sun azimuth ranges (yellow)



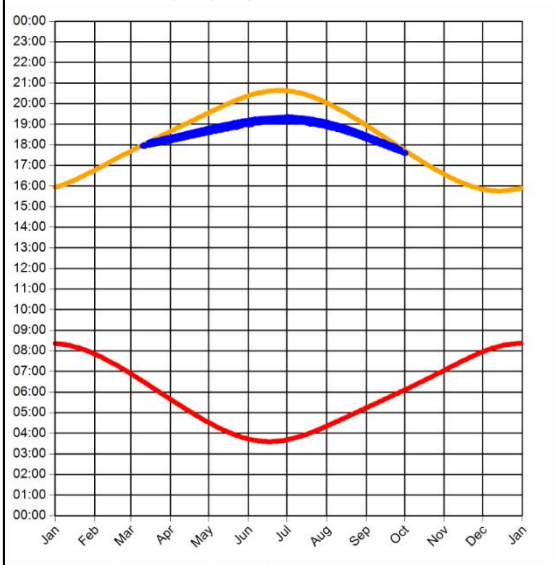
Min observer difference angle: 0.2°
Max observer difference angle: 22°

Dwelling Receptors

Panel tilt: 8 degrees

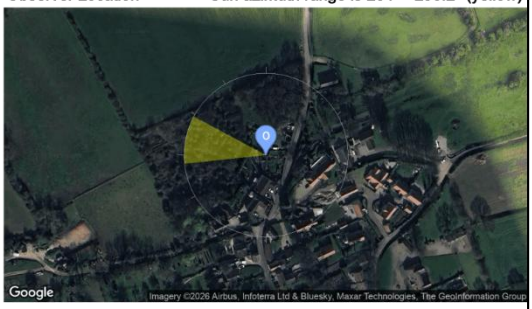
Observer 1 Results

Reflection Date/Time (GMT) Graph



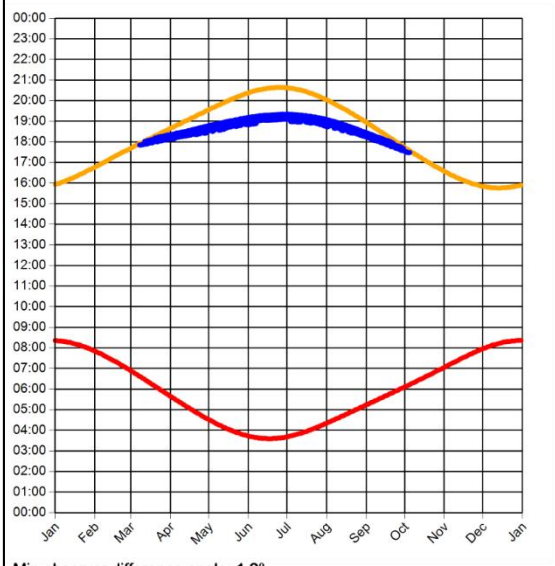
Min observer difference angle: 0.5°
Max observer difference angle: 13.4°

Observer Location — Sun azimuth range is 264° - 298.2° (yellow)



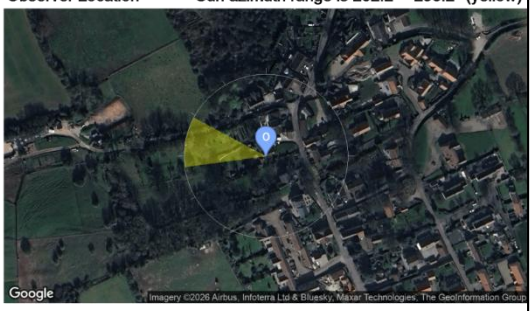
Observer 2 Results

Reflection Date/Time (GMT) Graph



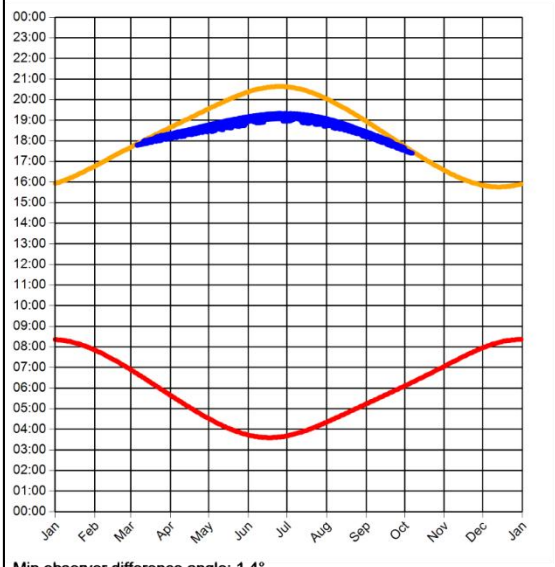
Min observer difference angle: 1.2°
Max observer difference angle: 15.8°

Observer Location — Sun azimuth range is 262.2° - 298.2° (yellow)



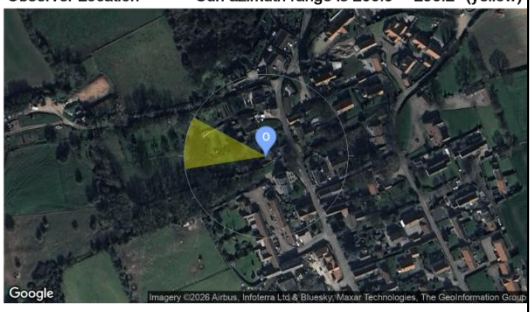
Observer 3 Results

Reflection Date/Time (GMT) Graph



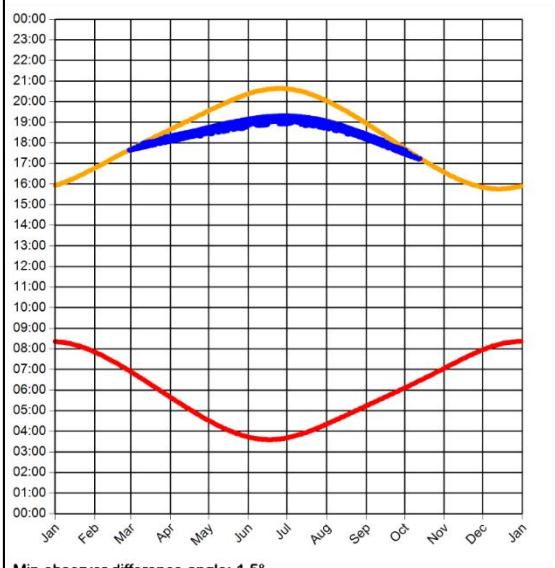
Min observer difference angle: 1.4°
Max observer difference angle: 16.5°

Observer Location — Sun azimuth range is 260.9° - 298.2° (yellow)



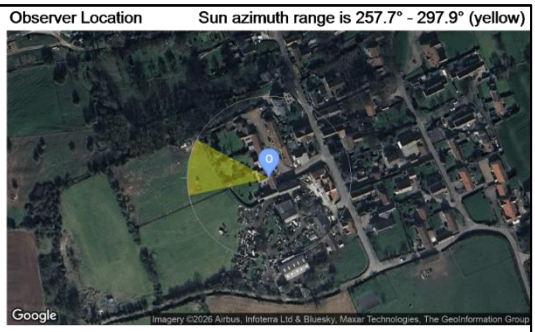
Observer 4 Results

Reflection Date/Time (GMT) Graph



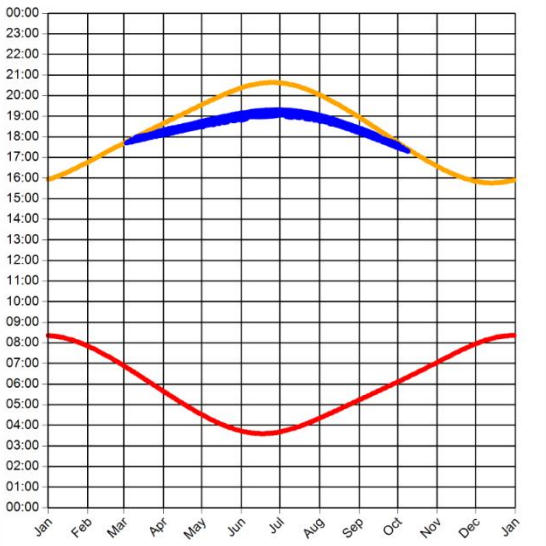
Min observer difference angle: 1.5°
Max observer difference angle: 17.2°

Observer Location — Sun azimuth range is 257.7° - 297.9° (yellow)



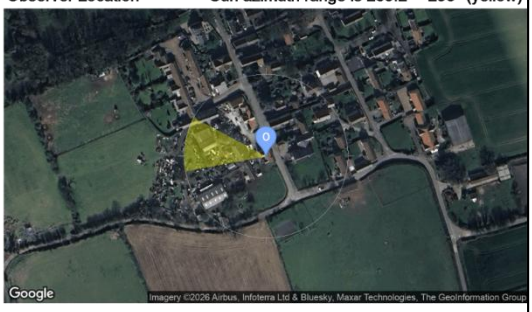
Observer 5 Results

Reflection Date/Time (GMT) Graph



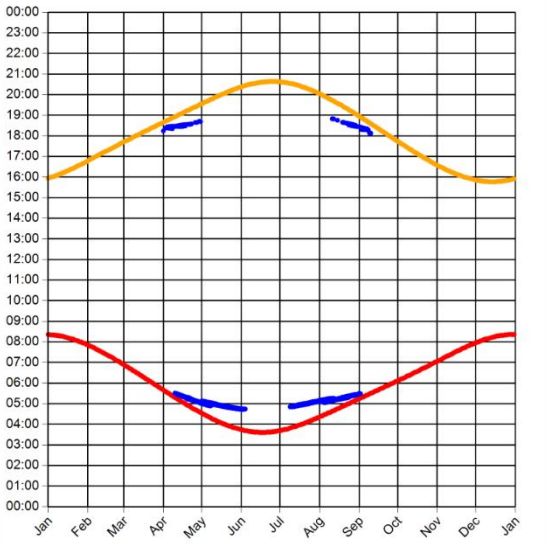
Min observer difference angle: 1.4°
Max observer difference angle: 15.9°

Observer Location — Sun azimuth range is 259.2° - 298° (yellow)



Observer 6 Results

Reflection Date/Time (GMT) Graph



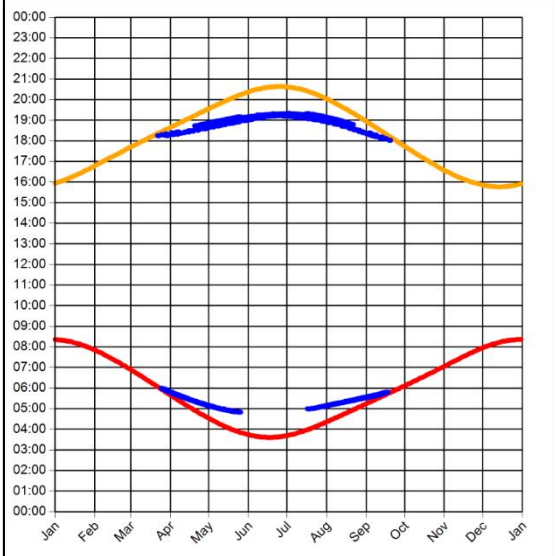
Min observer difference angle: 0°
Max observer difference angle: 7.9°

Observer Location — Sun azimuth ranges (yellow)



Observer 7 Results

Reflection Date/Time (GMT) Graph



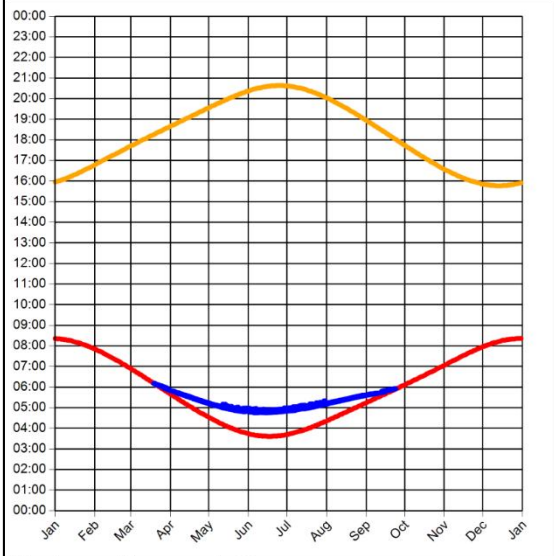
Min observer difference angle: 0°
Max observer difference angle: 12.4°

Observer Location — Sun azimuth ranges (yellow)



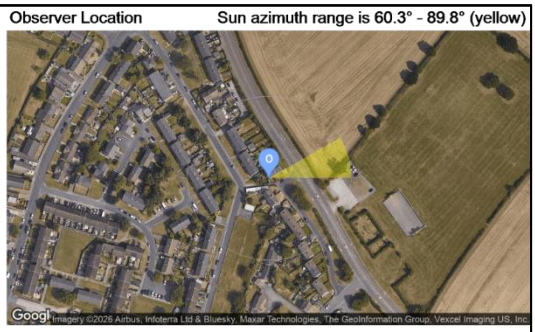
Observer 8 Results

Reflection Date/Time (GMT) Graph



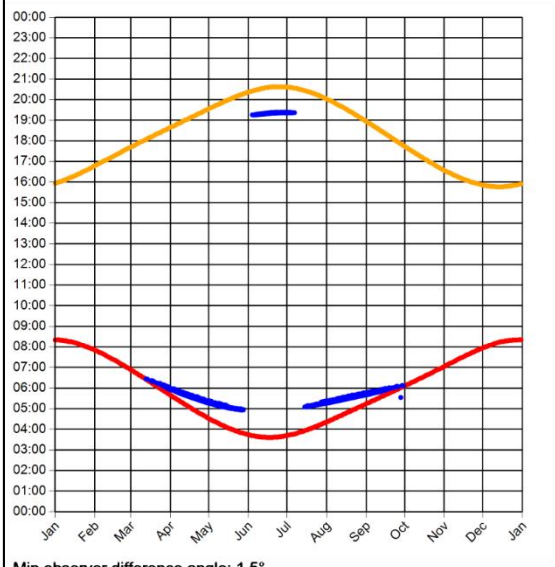
Min observer difference angle: 0°
Max observer difference angle: 10.5°

Observer Location — Sun azimuth range is 60.3° - 89.8° (yellow)



Observer 9 Results

Reflection Date/Time (GMT) Graph



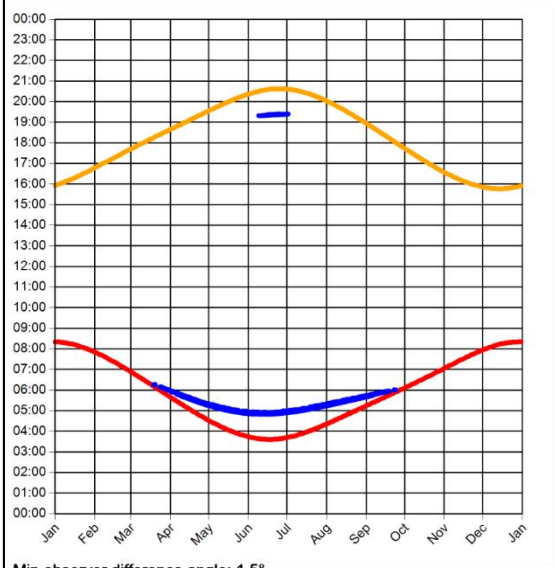
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 1.5°
Max observer difference angle: 9.7°

Observer 10 Results

Reflection Date/Time (GMT) Graph



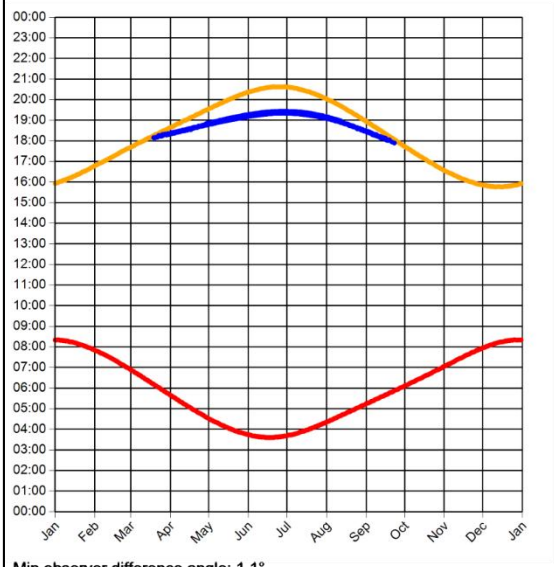
Observer Location | Sun azimuth ranges (yellow)



Min observer difference angle: 1.5°
Max observer difference angle: 10.4°

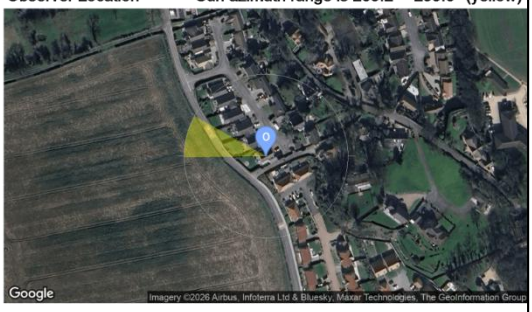
Observer 11 Results

Reflection Date/Time (GMT) Graph



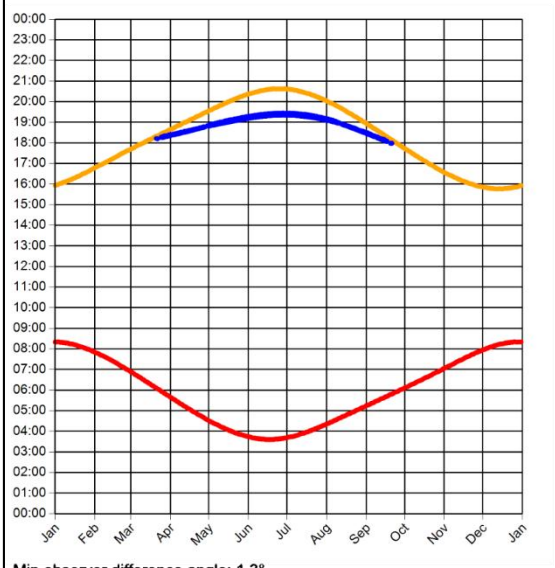
Min observer difference angle: 1.1°
Max observer difference angle: 9.1°

Observer Location — Sun azimuth range is 269.2° - 299.3° (yellow)



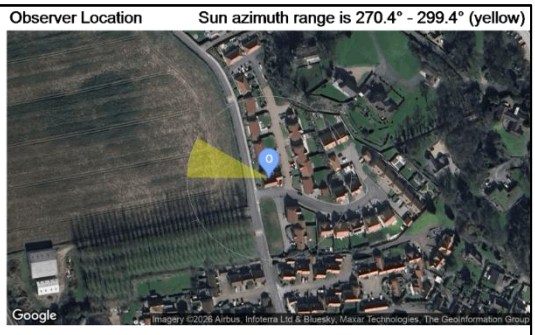
Observer 12 Results

Reflection Date/Time (GMT) Graph



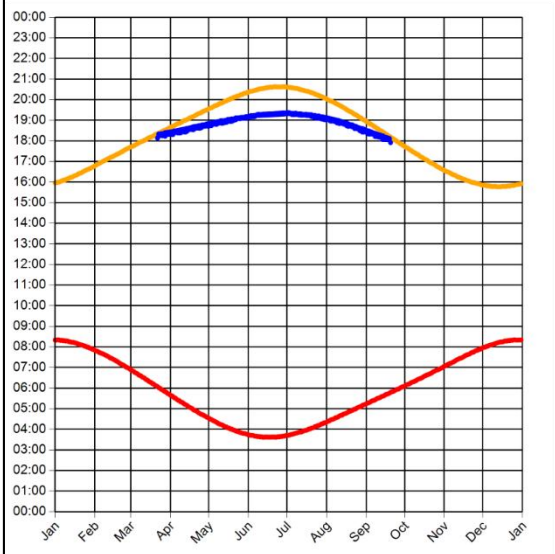
Min observer difference angle: 1.3°
Max observer difference angle: 9.1°

Observer Location — Sun azimuth range is 270.4° - 299.4° (yellow)



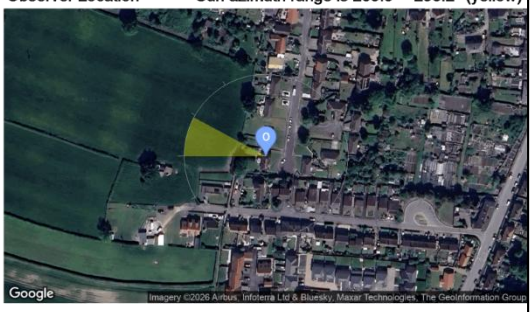
Observer 13 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.3°
Max observer difference angle: 10.3°

Observer Location Sun azimuth range is 269.9° - 298.2° (yellow)

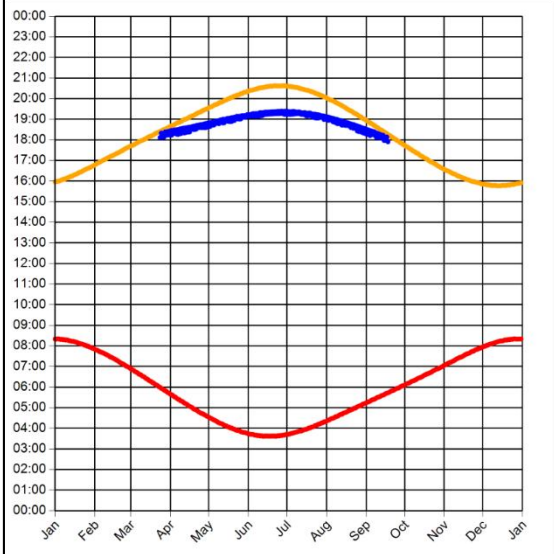


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



Observer 14 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.5°
Max observer difference angle: 11°

Observer Location Sun azimuth range is 270.1° - 298.7° (yellow)

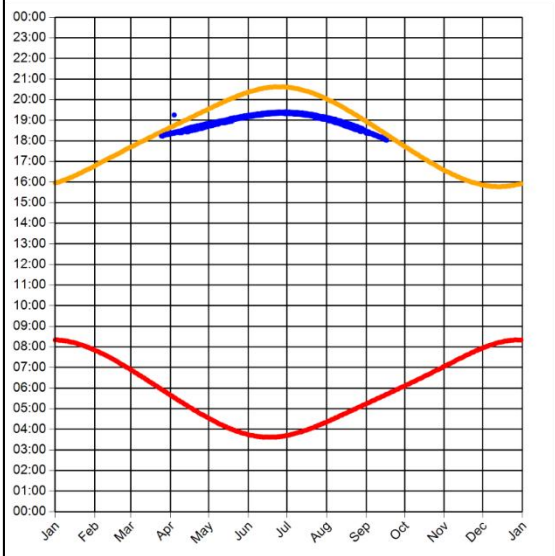


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



Observer 15 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 2.1°
Max observer difference angle: 9.6°

Observer Location — Sun azimuth range is 271.8° - 298.9° (yellow)

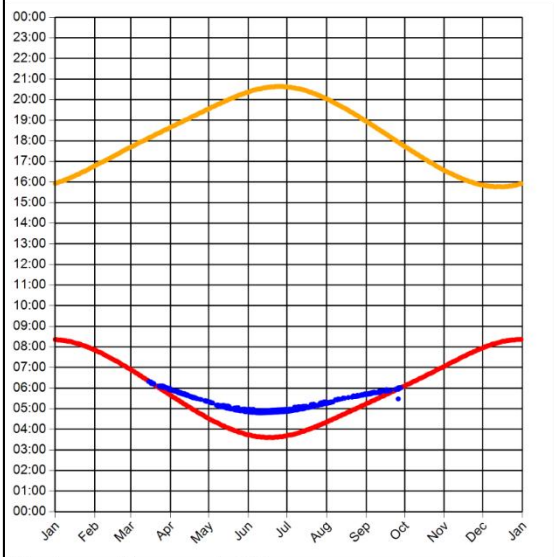


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



Observer 16 Results

Reflection Date/Time (GMT) Graph



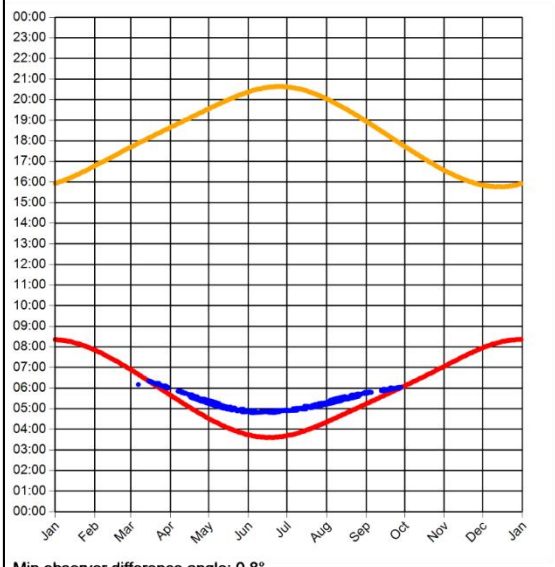
Min observer difference angle: 0.1°
Max observer difference angle: 10.7°

Observer Location — Sun azimuth range is 61° - 92.3° (yellow)



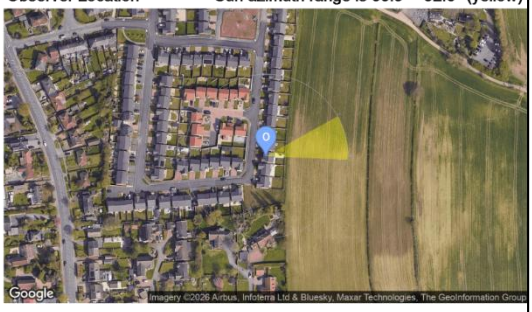
Observer 17 Results

Reflection Date/Time (GMT) Graph



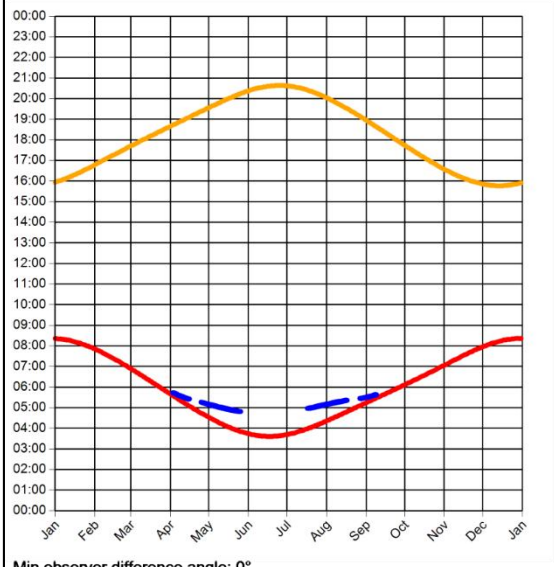
Min observer difference angle: 0.8°
Max observer difference angle: 9.7°

Observer Location — Sun azimuth range is 60.9° - 92.6° (yellow)



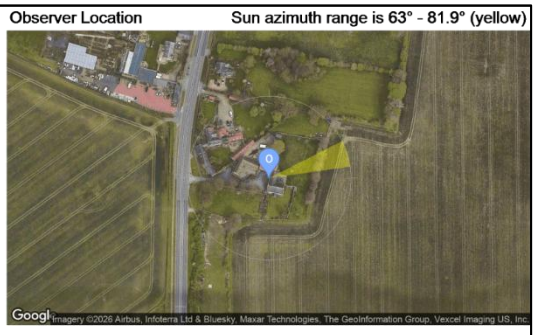
Observer 18 Results

Reflection Date/Time (GMT) Graph



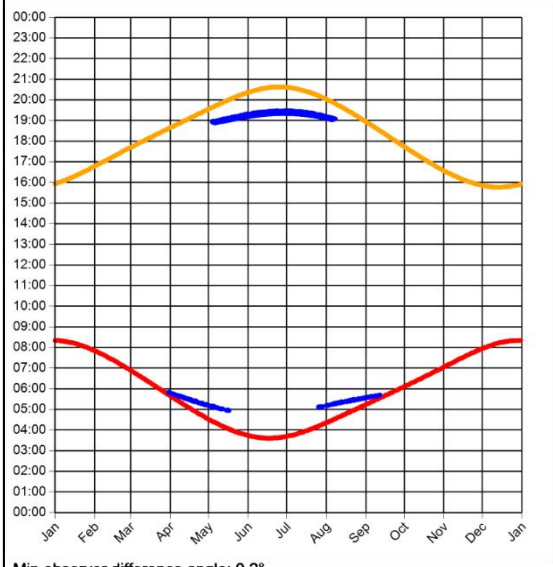
Min observer difference angle: 0°
Max observer difference angle: 6.2°

Observer Location — Sun azimuth range is 63° - 81.9° (yellow)



Observer 19 Results

Reflection Date/Time (GMT) Graph



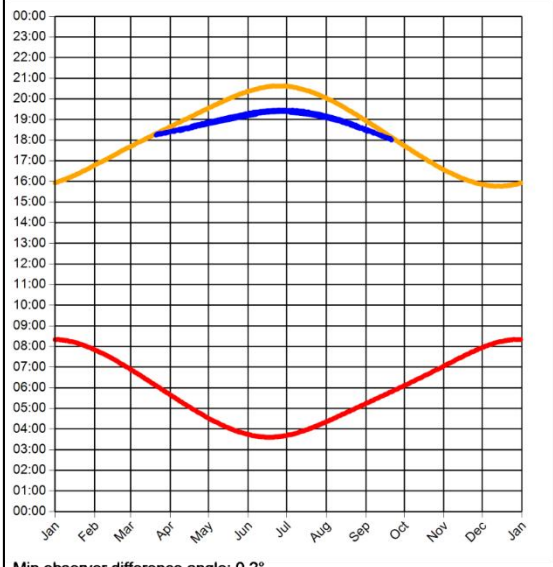
Min observer difference angle: 0.2°
Max observer difference angle: 9.2°

Observer Location — Sun azimuth ranges (yellow)



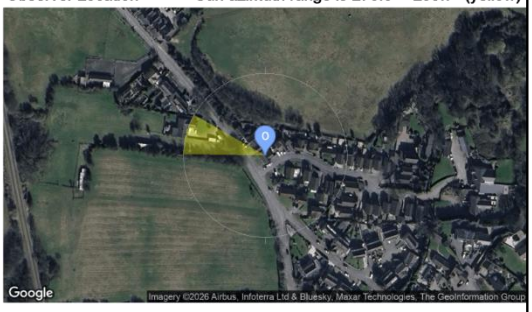
Observer 20 Results

Reflection Date/Time (GMT) Graph



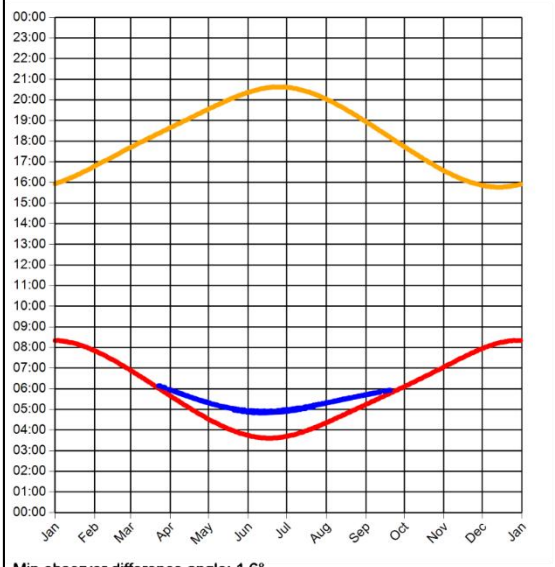
Min observer difference angle: 0.2°
Max observer difference angle: 8.9°

Observer Location — Sun azimuth range is 270.8° - 299.7° (yellow)



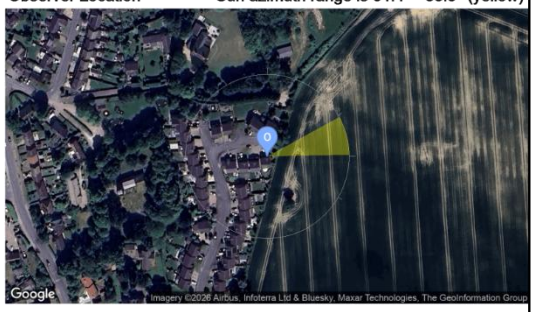
Observer 21 Results

Reflection Date/Time (GMT) Graph



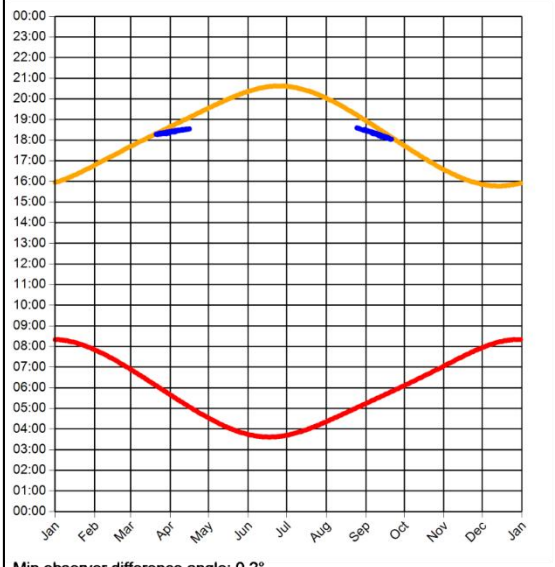
Min observer difference angle: 1.6°
Max observer difference angle: 10.3°

Observer Location — Sun azimuth range is 61.4° - 88.9° (yellow)



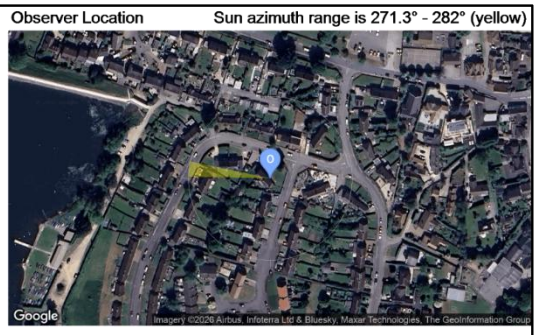
Observer 22 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.2°
Max observer difference angle: 5.1°

Observer Location — Sun azimuth range is 271.3° - 282° (yellow)



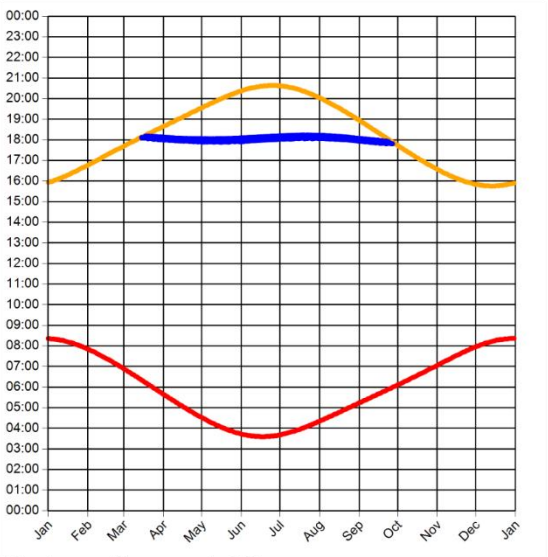
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



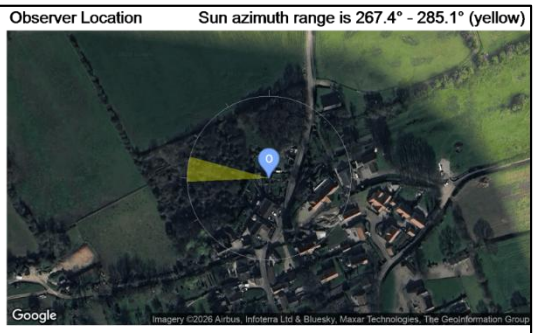
Panel tilt: 25 degrees

Observer 1 Results

Reflection Date/Time (GMT) Graph



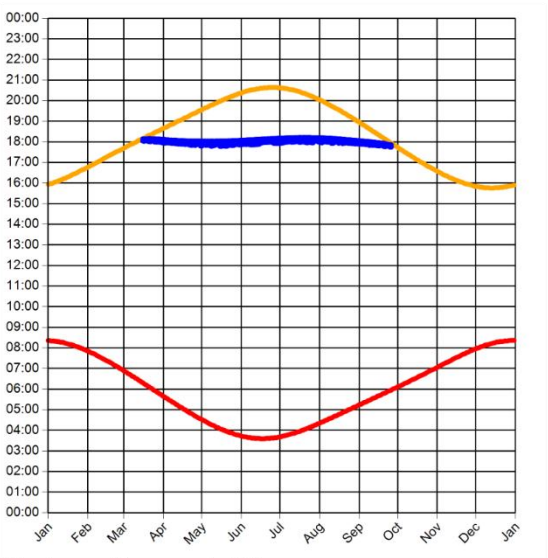
Observer Location — Sun azimuth range is 267.4° - 285.1° (yellow)



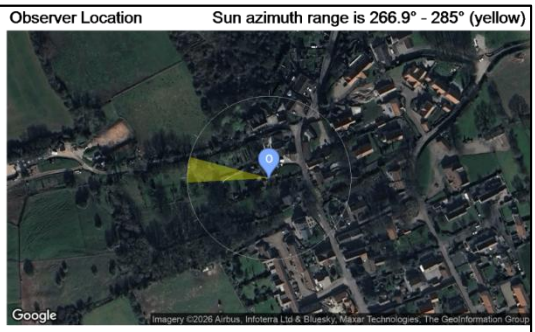
Min observer difference angle: 0.9°
Max observer difference angle: 24.5°

Observer 2 Results

Reflection Date/Time (GMT) Graph



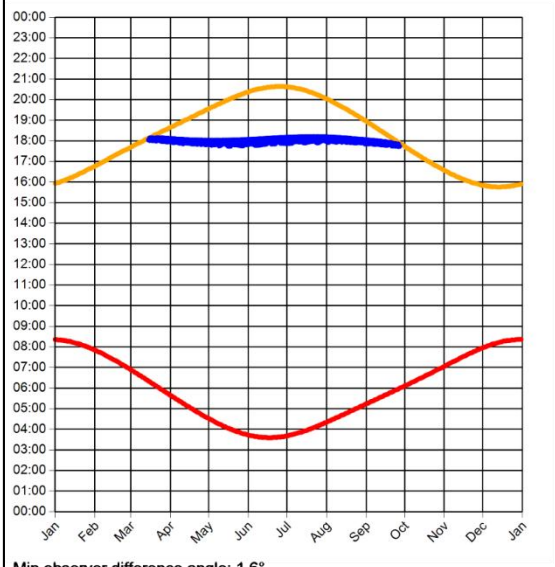
Observer Location — Sun azimuth range is 266.9° - 285° (yellow)



Min observer difference angle: 1.5°
Max observer difference angle: 26.8°

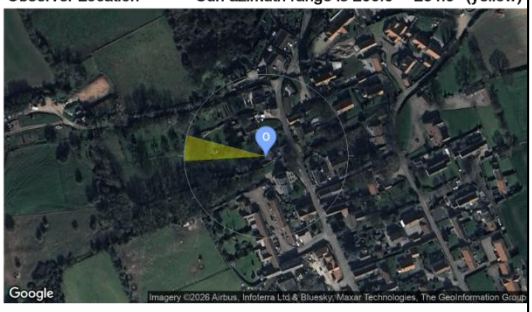
Observer 3 Results

Reflection Date/Time (GMT) Graph



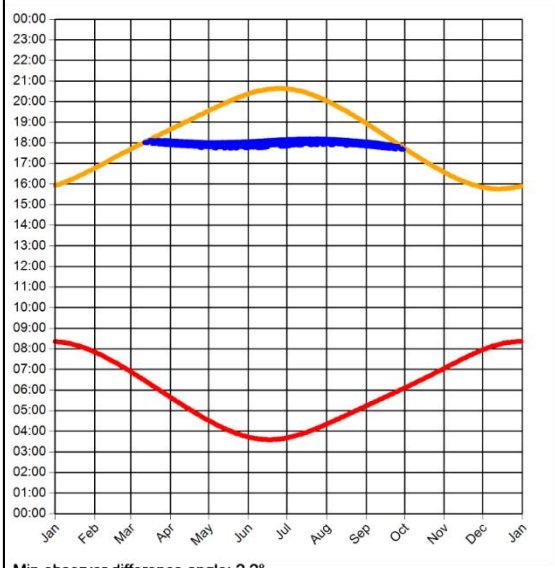
Min observer difference angle: 1.6°
Max observer difference angle: 28.5°

Observer Location — Sun azimuth range is 266.6° - 284.9° (yellow)



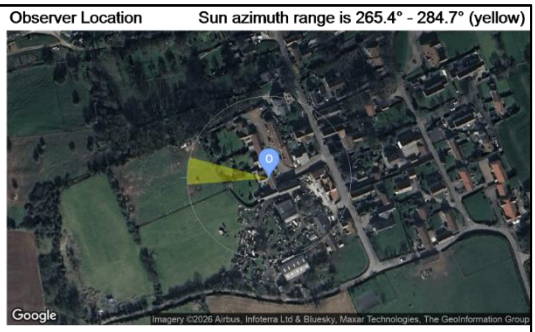
Observer 4 Results

Reflection Date/Time (GMT) Graph



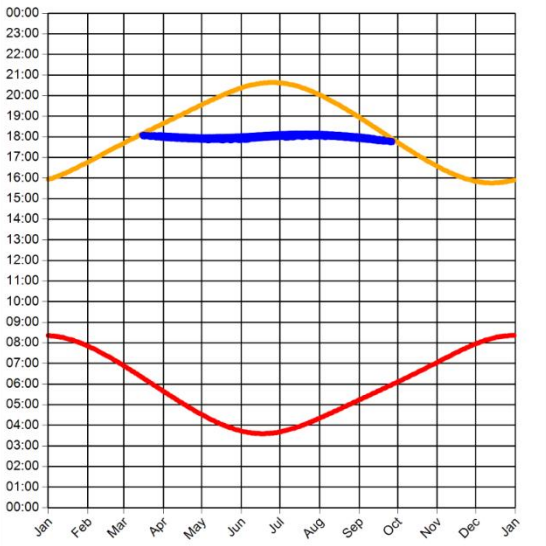
Min observer difference angle: 2.2°
Max observer difference angle: 29°

Observer Location — Sun azimuth range is 265.4° - 284.7° (yellow)



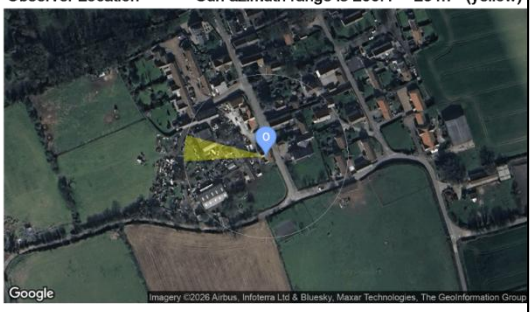
Observer 5 Results

Reflection Date/Time (GMT) Graph



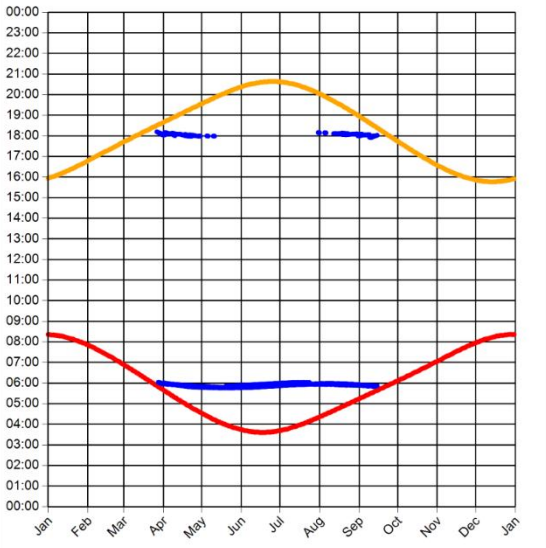
Min observer difference angle: 2.1°
Max observer difference angle: 26.6°

Observer Location — Sun azimuth range is 266.4° - 284.7° (yellow)



Observer 6 Results

Reflection Date/Time (GMT) Graph



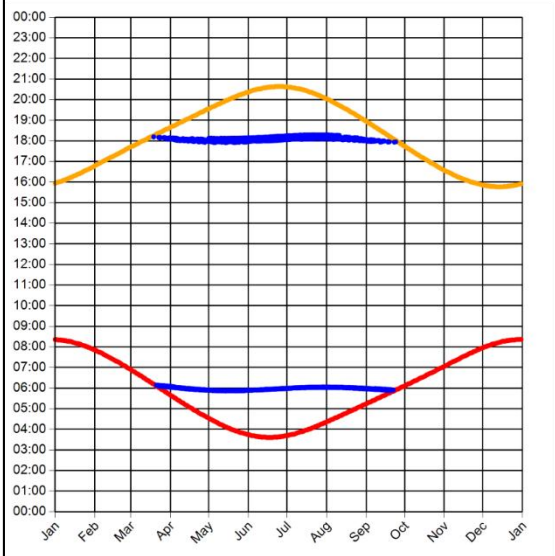
Min observer difference angle: 0°
Max observer difference angle: 18.1°

Observer Location — Sun azimuth ranges (yellow)



Observer 7 Results

Reflection Date/Time (GMT) Graph



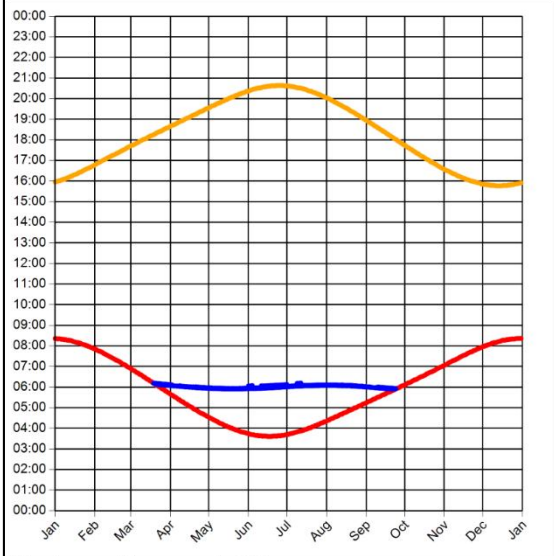
Min observer difference angle: 0°
Max observer difference angle: 24.3°

Observer Location — Sun azimuth ranges (yellow)



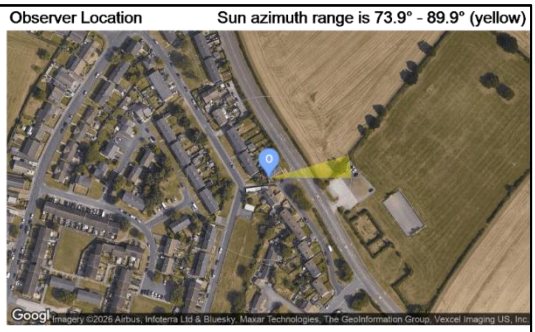
Observer 8 Results

Reflection Date/Time (GMT) Graph



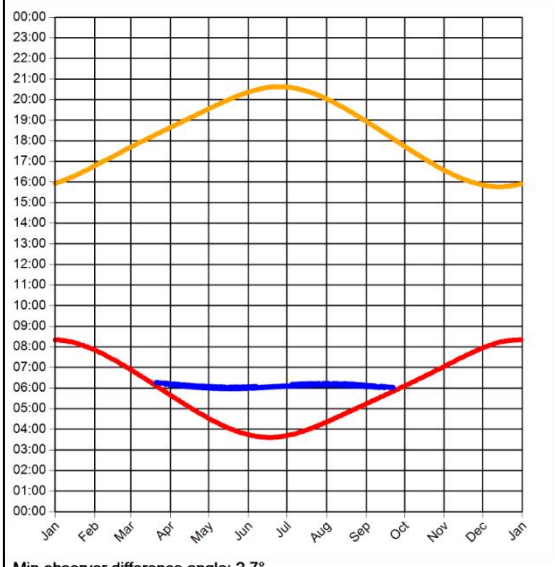
Min observer difference angle: 0.1°
Max observer difference angle: 21.5°

Observer Location — Sun azimuth range is 73.9° - 89.9° (yellow)



Observer 9 Results

Reflection Date/Time (GMT) Graph



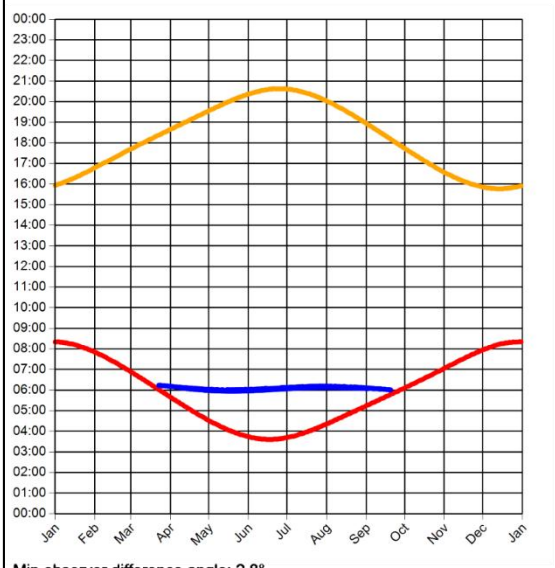
Min observer difference angle: 2.7°
Max observer difference angle: 22°

Observer Location — Sun azimuth range is 74.8° - 90.7° (yellow)



Observer 10 Results

Reflection Date/Time (GMT) Graph



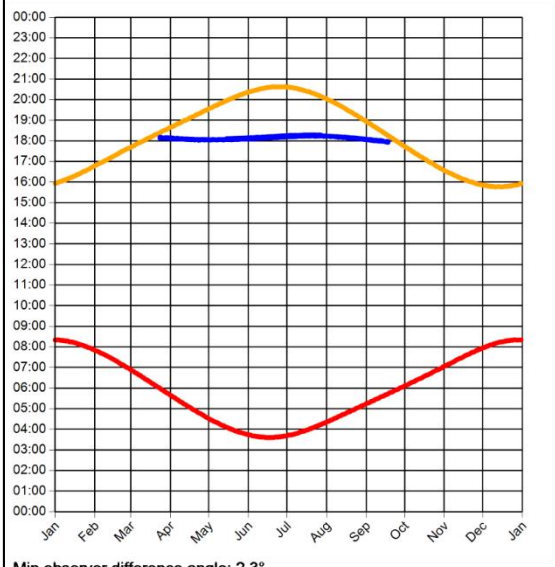
Min observer difference angle: 2.8°
Max observer difference angle: 21.6°

Observer Location — Sun azimuth range is 74.5° - 89.9° (yellow)



Observer 11 Results

Reflection Date/Time (GMT) Graph



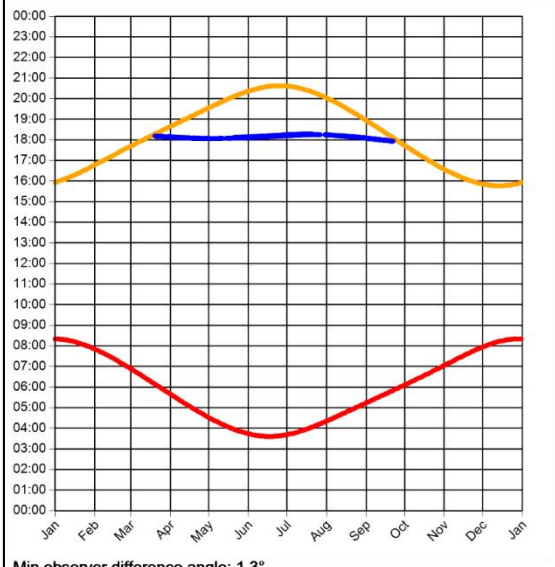
Min observer difference angle: 2.3°
Max observer difference angle: 20.4°

Observer Location — Sun azimuth range is 270.4° - 285.8° (yellow)



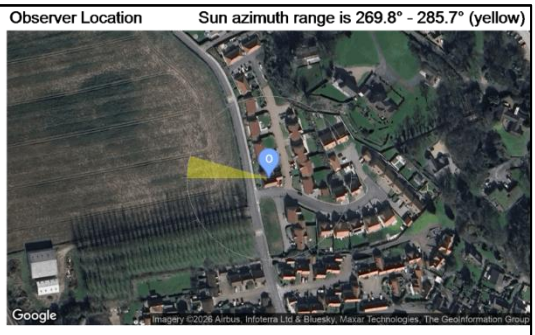
Observer 12 Results

Reflection Date/Time (GMT) Graph



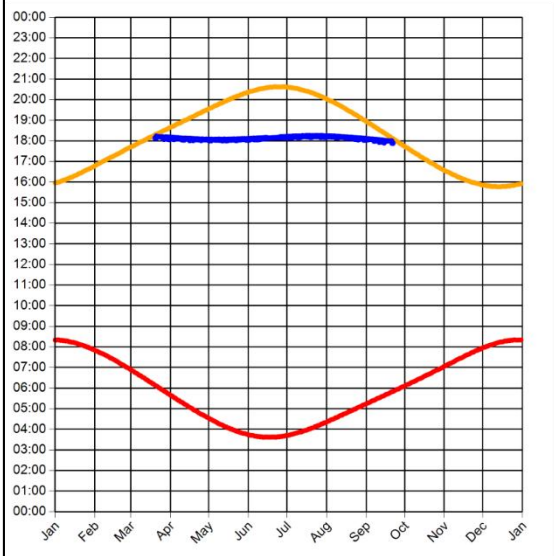
Min observer difference angle: 1.3°
Max observer difference angle: 20.2°

Observer Location — Sun azimuth range is 269.8° - 285.7° (yellow)



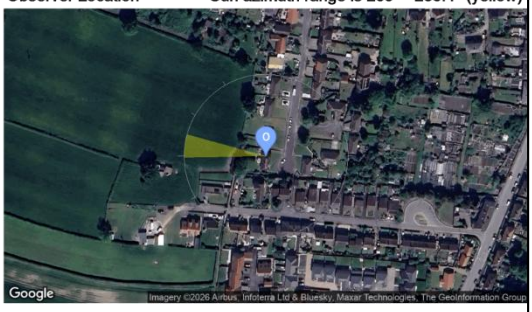
Observer 13 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.4°
Max observer difference angle: 21.7°

Observer Location — Sun azimuth range is 269° - 285.4° (yellow)

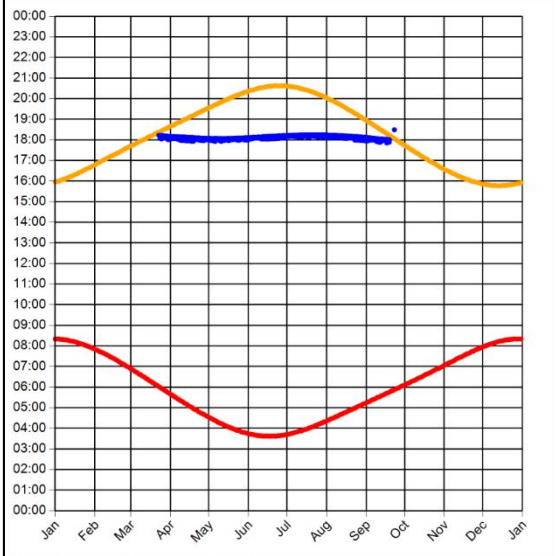


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



Observer 14 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.9°
Max observer difference angle: 23.2°

Observer Location — Sun azimuth range is 269.5° - 285.4° (yellow)

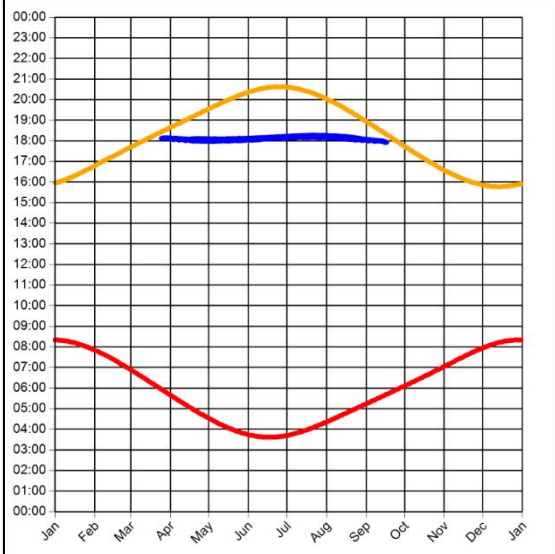


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



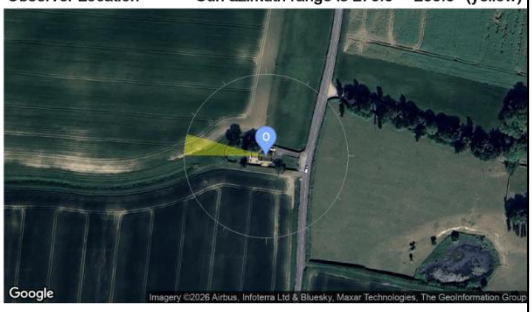
Observer 15 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 3.5°
Max observer difference angle: 22.2°

Observer Location — Sun azimuth range is 270.5° - 285.5° (yellow)

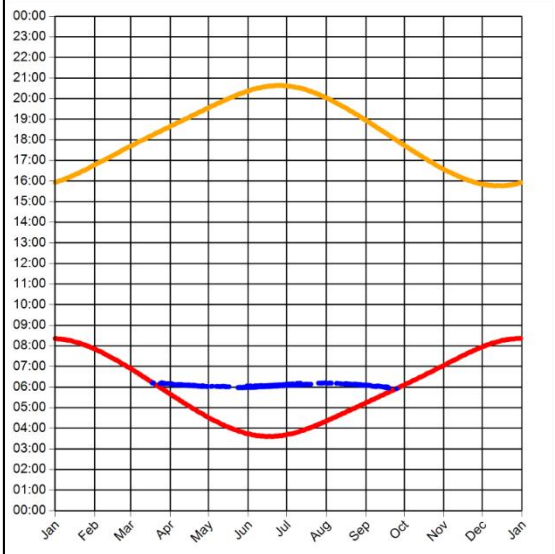


Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)



Observer 16 Results

Reflection Date/Time (GMT) Graph



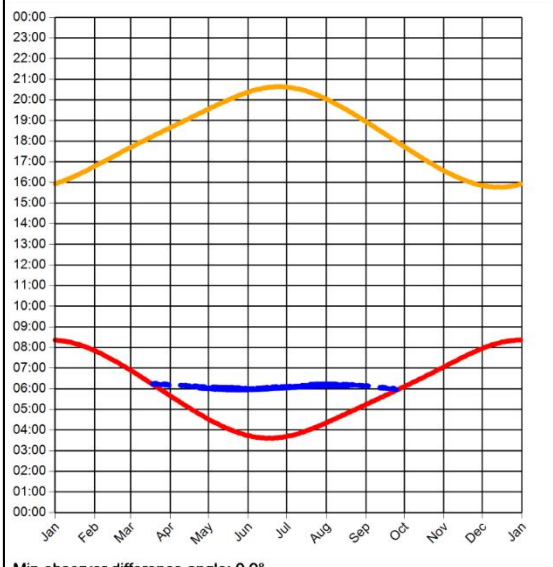
Min observer difference angle: 0.2°
Max observer difference angle: 21.8°

Observer Location — Sun azimuth range is 74.7° - 90.2° (yellow)



Observer 17 Results

Reflection Date/Time (GMT) Graph



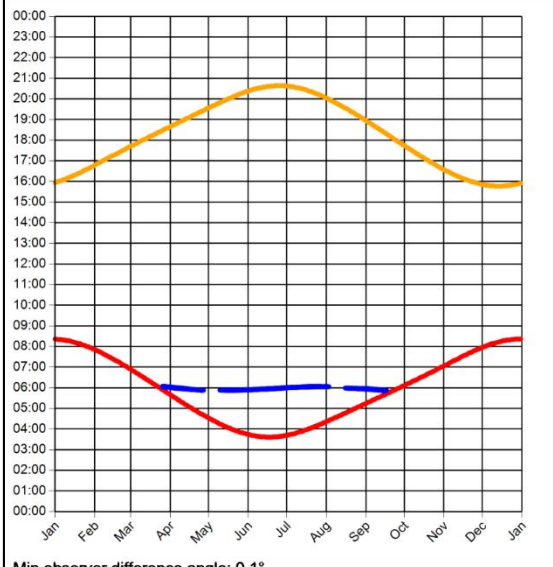
Min observer difference angle: 0.9°
Max observer difference angle: 21.7°

Observer Location — Sun azimuth range is 74.3° - 90.9° (yellow)



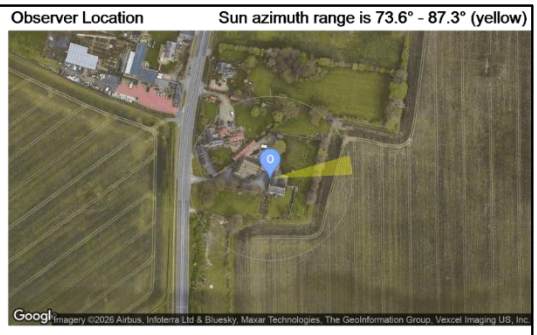
Observer 18 Results

Reflection Date/Time (GMT) Graph



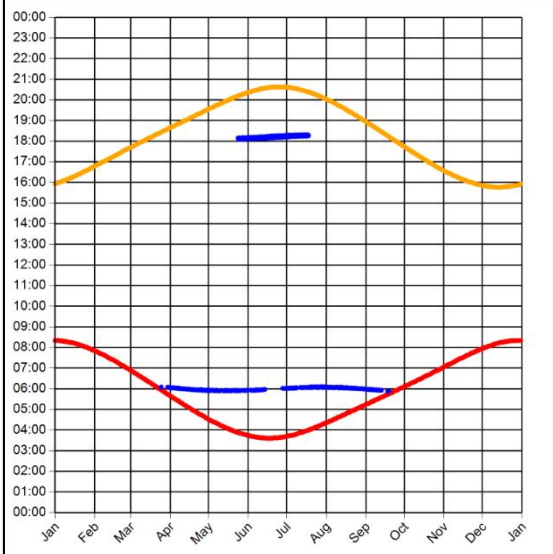
Min observer difference angle: 0.1°
Max observer difference angle: 18.5°

Observer Location — Sun azimuth range is 73.6° - 87.3° (yellow)



Observer 19 Results

Reflection Date/Time (GMT) Graph



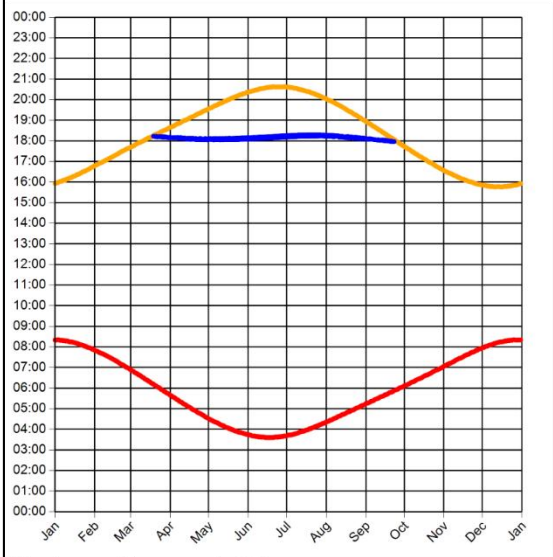
Min observer difference angle: 0.2°
Max observer difference angle: 20.2°

Observer Location — Sun azimuth ranges (yellow)



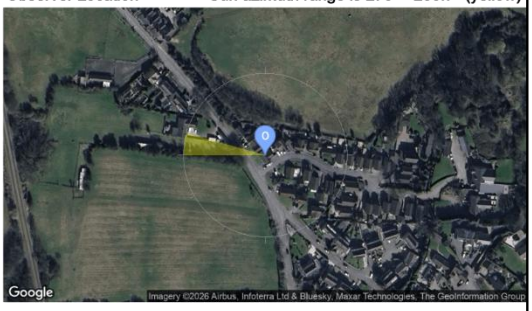
Observer 20 Results

Reflection Date/Time (GMT) Graph



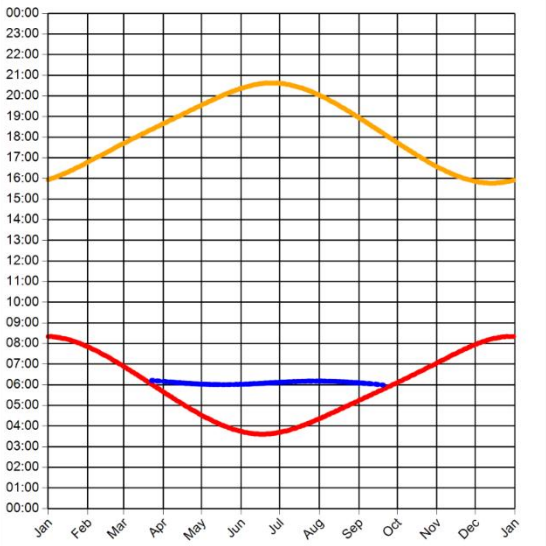
Min observer difference angle: 0.3°
Max observer difference angle: 20.5°

Observer Location — Sun azimuth range is 270° - 285.7° (yellow)



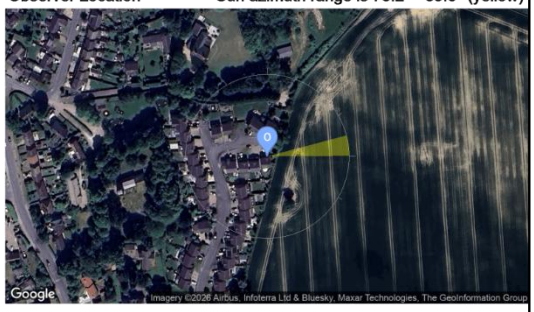
Observer 21 Results

Reflection Date/Time (GMT) Graph



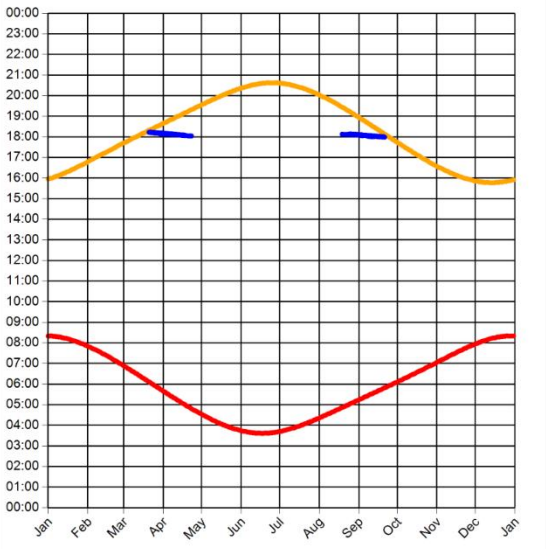
Min observer difference angle: 2.2°
Max observer difference angle: 21.6°

Observer Location — Sun azimuth range is 75.2° - 89.6° (yellow)



Observer 22 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.5°
Max observer difference angle: 12.2°

Observer Location — Sun azimuth range is 270.5° - 277.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)





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Annex C – Pager Power Analysis - Aviation Receptors

PAGERPOWER

Glint and Glare Aviation Assessment

ERM Limited

Whitestones Solar

January 2026



www.pagerpower.com

ADMINISTRATION PAGE

Job Reference:	15441B1
Author:	[redacted]
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Telephone:	

Reviewed By:	[redacted]
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Issue	Date	Detail of Changes
1	21 January 2026	Initial issue

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1 IDENTIFICATION OF RECEPTORS

1.1 Overview

The following subsections present the relevant data and receptors associated with Netherthorpe Airfield. Key information can be found via the NATS Aeronautical Information Publication (AIP) and the airfield's website.

Terrain data has been interpolated based on Ordnance Survey (OS) 50 Digital Terrain Model (DTM) data.

1.2 Airfield Information

Netherthorpe Airfield is a Civil Aviation Authority (CAA) licenced aerodrome from which the Sheffield Aero Club fly. The airfield has two operational runways, the details[1] of which are presented below:

- 06/24 measuring 573m by 36m (grass);
- 18/36 measuring 388m by 18m (grass).

1.3 Runways 06/24 and 18/36

Visual circuits are present for both runways at Netherthorpe Airfield. The published circuit pattern[2] is shown in Figure 1 on the following page.

The circuit path is modelled as follows:

- A resolution of 0.1 nautical miles (NM), i.e. points are placed every 0.1NM;
- A descent angle[3] of 5-degrees:
- A maximum height[4] of 800ft above the aerodrome reference point.

[1] Source: NATS AIP, January 2026.
[2] Source: h[redacted]
[3] Source: 5-degrees is deemed a typical descent angle for general aviation activity.
[4] Source[redacted]

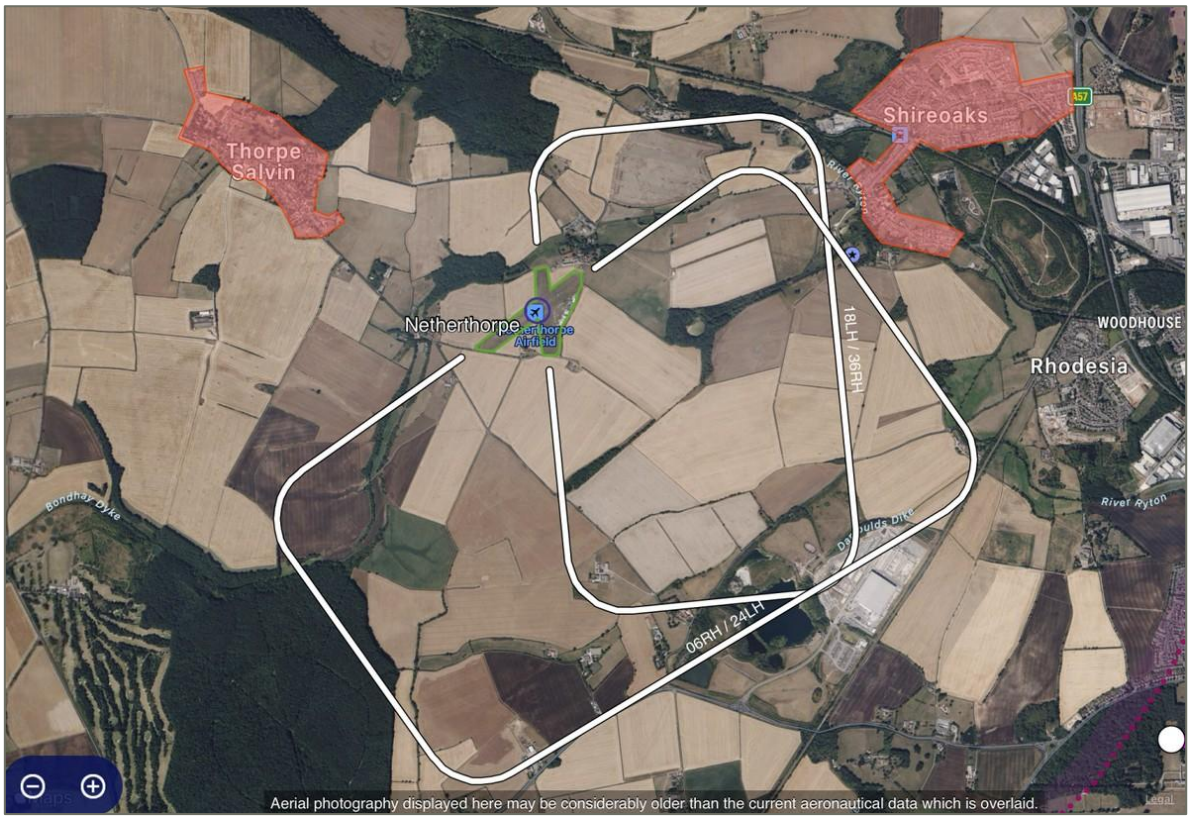


Figure 1 *Published circuit pattern*

The assessed receptors are shown in Figures 2 and 3 on the following pages.



Figure 2 *Circuit receptor - 06RH/24LH*

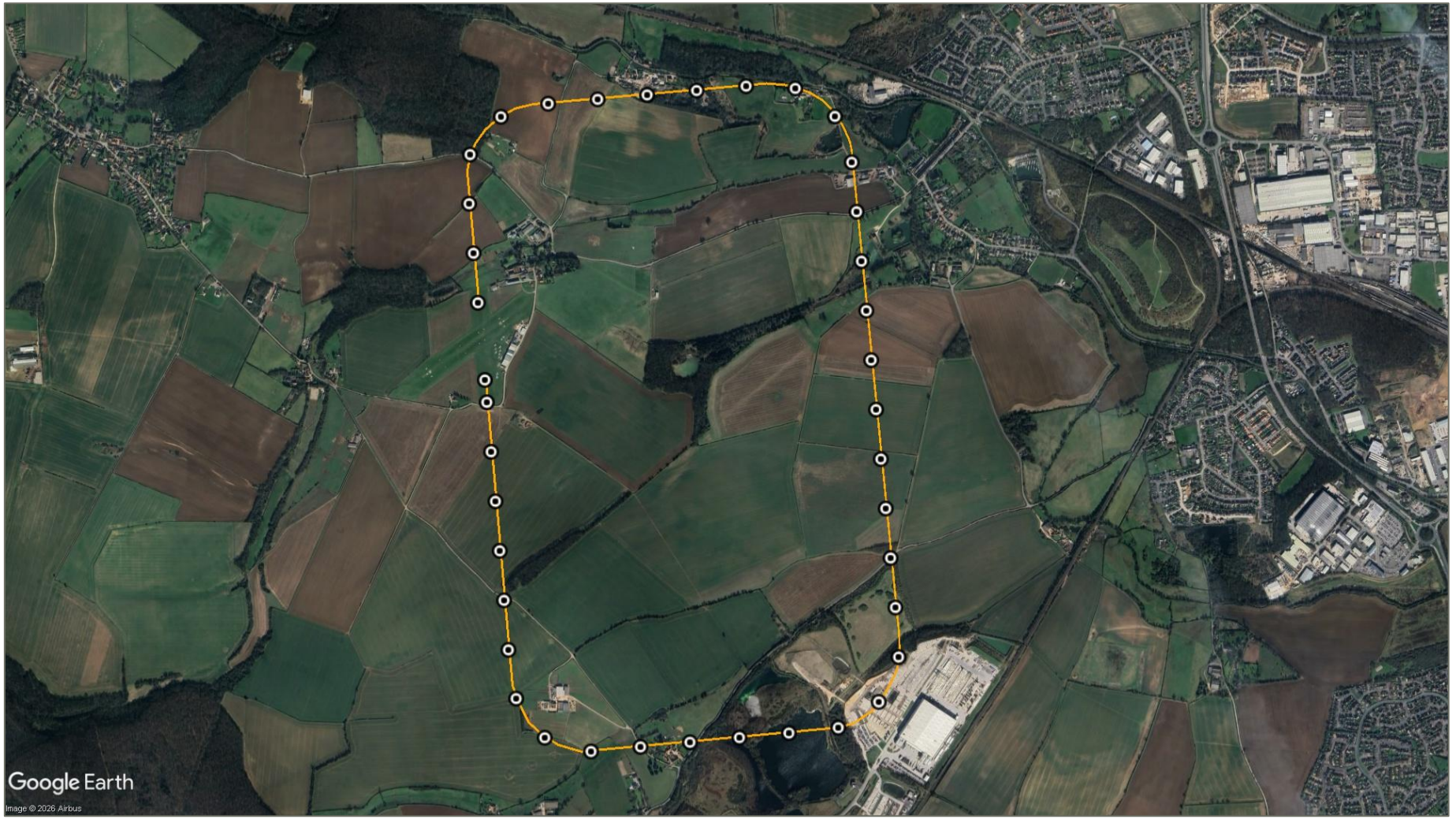


Figure 3 *Circuit receptor – 18LH/36RH*

2 GEOMETRIC ASSESSMENT RESULTS AND DISCUSSION

2.1 Overview

The following subsections present the significance of any predicted impact in the context of existing screening and the relevant criteria set out in each sub-section. The criteria are determined by the assessment process for each receptor, which are set out in Appendix A.

The geometric modelling has been carried out considering the following parameters:

- Azimuth angle: 180° (south facing);
- Tilt angle: 8° and 25°;
    - Each receptor has been assessed twice, once considering an angle of 8° and again considering an angle of 25°.
- Height above ground: 3.8m.

2.2 Glare Intensity Categorisation

The Pager Power and Forge models have been used to determine whether reflections are possible for aviation receptors. Intensity calculations (Forge Model) in line with the Sandia National Laboratories methodology have been undertaken. These calculations are routinely required for solar photovoltaic developments on or near aerodromes. The intensity model calculates the expected intensity of a reflection with respect to the potential for an after-image (or worse) occurring. The designation used by the model is presented in Table 1 below along with the associated colour coding.

Coding Used	Intensity Key
Glare beyond 50°	'Glare occurs outside of a pilot's primary field of view (50 degrees horizontally either side of the direction of travel)'
'Green Glare'	'Low potential for temporary after-image'
'Yellow Glare'	'Potential for temporary after-image'
'Red Glare'	'Potential for permanent eye damage'

Table 1 *Glare intensity designation*

This coding has been used in the table where a reflection has been calculated and is in accordance with Sandia National Laboratories' methodology. In addition, the intensity model allows for the assessment of a variety of solar panel surface materials. This assessment has considered solar panels with the following surface materials:

- Smooth glass without an anti-reflective coating; and,
- Smooth glass with an anti-reflective coating.

Results for each surface material are presented within the findings. Other surfaces that could be modelled include:

- Light textured glass without an anti-reflective coating;
- Light textured glass with an anti-reflective coating; or
- Deeply textured glass.

2.3 Key Considerations – Runway Approach Paths

The process for determining impact significance is defined in Appendix A. For the runway approach paths, the key considerations are:

- Whether a reflection is predicted to be experienced in practice;
- The location of glare relative to a pilot's primary field-of-view (50 degrees either side of the approach bearing);
- The intensity of glare for the solar reflections:
  - Glare with 'low potential for temporary after-image' ('green' glare);
  - Glare with 'potential for temporary after-image' ('yellow' glare);
  - Glare with 'potential for permanent eye damage' ('red' glare).
- Whether a reflection is predicted to be operationally significant in practice or not.

Where no solar reflections are geometrically possible or where solar reflections are predicted to be significantly screened, no impact is predicted, and mitigation is not required.

Where solar reflections have an intensity no greater than 'low potential for temporary after-image' (green glare) or occur outside of a pilot's primary field-of-view (50 degrees either side of the approach bearing), the impact significance is low, and mitigation is not required.

Glare with 'potential for a temporary after-image' (yellow glare) was formerly not permissible under the interim guidance provided by the Federal Aviation Administration in the USA[5] for on-airfield solar. Whilst this guidance was never formally applicable outside of the USA, it has been a common point of reference internationally. Pager Power recommends a pragmatic approach whereby instances of 'yellow' glare are evaluated in a technical and operational context. As per Pager Power's glint and glare guidance document[6], where solar reflections are of an intensity of 'potential for temporary after-image', expert assessment of the following relevant factors is required to determine the impact significance[7]:

- The likely traffic volumes and level of safeguarding at the aerodrome – licensed aerodromes typically have higher traffic volumes and are formally safeguarded. Unlicensed aerodromes have greater capacity for operational acceptance;

[5] This FAA guidance from 2013 has since been superseded by the FAA guidance in 2021 whereby airports are tasked with determining safety requirements themselves.

[6] [redacted], Fourth Edition, September 2022.

[7] This approach taken is reflective of the changes made in the 2021 FAA guidance; however, it should be noted that this guidance states that it is up to the airport to determine the safety requirements themselves. Therefore, an airport may not accept any yellow glare towards approach paths.

- The time of day at which glare is predicted and whether the aerodrome will be operational such that pilots can be on the approach at the time of day at which glare is predicted;
- The duration of any predicted glare – glare that occurs for low durations throughout the year is less likely to be experienced than glare that occurs for longer durations throughout a year;
- The location of the source of glare relative to a pilot's primary field-of-view;
- The relative size of the reflecting panel area and whether the reflecting area takes up a large percentage of a pilot's primary field-of-view;
- The location of the source of glare relative to the position of the Sun at the times and dates in which solar reflections are geometrically possible – effects that coincide with direct sunlight appear less prominent than those that do not;
- The intensity of the predicted glare;
- The level of predicted effect relative to existing sources of glare – a solar reflection is less noticeable by pilots when there are existing reflective surfaces in the surrounding environment.

Following consideration of these relevant factors, where the solar reflection is deemed not significant, a low impact is predicted, and mitigation is not recommended; however, consultation with the aerodrome is recommended to understand their position along with any feedback or comments regarding the proposed development. Where the solar reflection is deemed significant, the impact significance is moderate, and mitigation is recommended.

Where solar reflections have an intensity of 'potential for permanent eye damage', the impact significance is high, and mitigation is required.

2.4 Assessment Results

Tables 2 and 3 on the following pages presents for each modelling scenario[8]:

- Geometric modelling results;
- Glare intensity;
- Commentary on acceptability of predicted glare scenario.

[8] Considering alternative tilt angles.

Visual Circuit	Modelled Tilt Angle	Geometric Modelling Result	Glare Intensity	Commentary
06RH/24LH	8-degree tilt	Solar reflections are geometrically possible	**'Yellow'**	This glare intensity is typically not considered acceptable unless it can be operationally accommodated within the airfield's operations It is recommended that installed panels are fitted with an anti-reflective coating to reduce the predicted intensity
	25-degree tilt	Solar reflections are geometrically possible	**'Yellow'**	
18LH/36RH	8-degree tilt	Solar reflections are geometrically possible	**'Green'**	This glare intensity is considered acceptable in accordance with the associated guidance (Appendix A) and industry best practice pertaining to 2-mile approach paths at licenced aerodromes It can reliably be concluded that this level of glare is also acceptable for the visual circuits at Netherthorpe Airfield
	25-degree tilt	Solar reflections are geometrically possible	**'Yellow'**	This glare intensity is typically not considered acceptable unless it can be operationally accommodated within the airfield's operations It is recommended that installed panels are fitted with an anti-reflective coating to reduce the predicted intensity

Table 2 *Geometric modelling results – Surface: without anti-reflective coating*

Visual Circuit	Modelled Tilt Angle	Geometric Modelling Result	Glare Intensity	Commentary
06RH/24LH	8-degree tilt	Solar reflections are geometrically possible	**'Green'**	This glare intensity is considered acceptable in accordance with the associated guidance (Appendix A) and industry best practice pertaining to 2-mile approach paths at licenced aerodromes It can reliably be concluded that this level of glare is also acceptable for the visual circuits at Netherthorpe Airfield
	25-degree tilt	Solar reflections are geometrically possible	**'Green'**	
18LH/36RH	8-degree tilt	Solar reflections are geometrically possible	**'Green'**	
	25-degree tilt	Solar reflections are geometrically possible	**'Green'**	

Table 3 *Geometric modelling results – Surface: with anti-reflective coating*

2.5 Conclusions

Solar reflections with “potential for temporary after-image” are predicted towards the visual circuits at Netherthorpe Airfield when considering panels **without** an Anti-Reflective Coating (ARC).

Solar reflections with “low-potential temporary after-image” are predicted towards the visual circuits when considering panels **with** an ARC.

Considering the associated guidance and industry best practice pertaining to 2-mile approach paths at licensed aerodromes, solar reflections with “low potential for temporary after-image” are acceptable. It is deemed this intensity of reflections is also acceptable for the visual circuits at Netherthorpe Airfield.

It is recommended that panels are proposed **with** an ARC such that predicted reflections are of a lower intensity. Subject to this, a low impact is predicted and mitigation is not recommended.

APPENDIX A – GLINT AND GLARE IMPACT SIGNIFICANCE

Overview

The significance of glint and glare will vary for different receptors. The following section presents a general overview of the significance criteria with respect to experiencing a solar reflection.

Impact Significance Definition

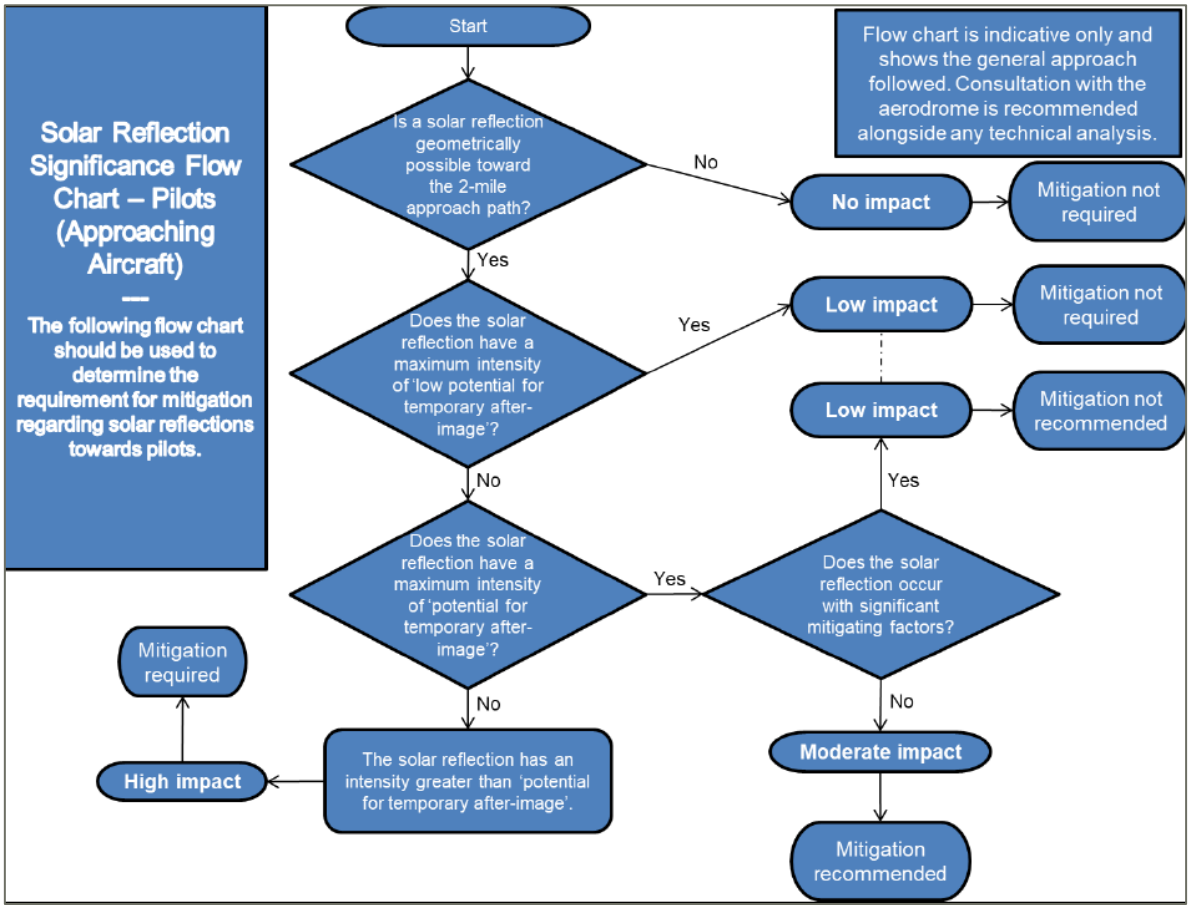
The table below presents the recommended definition of 'impact significance' in glint and glare terms and the requirement for mitigation under each.

Impact Significance	Definition	Mitigation Requirement
No Impact	A solar reflection is not geometrically possible or will not be visible from the assessed receptor.	No mitigation required.
Low	A solar reflection is geometrically possible however any impact is considered to be small such that mitigation is not required e.g. intervening screening will limit the view of the reflecting solar panels significantly.	No mitigation recommended.
Moderate	A solar reflection is geometrically possible and visible however it occurs under conditions that do not represent a worst-case given individual receptor criteria.	Mitigation recommended.
High	A solar reflection is geometrically possible and visible under worst-case conditions that will produce a significant impact given individual receptor criteria	Mitigation will be required if the proposed development is to proceed.

Impact significance definition

Impact Significance Determination for Approaching Aircraft

The flow chart presented below has been followed when determining the impact significance and mitigation requirement for approaching aircraft.



Approach path receptor mitigation requirement flow chart

APPENDIX B – DETAILED MODELLING RESULTS

Overview

The Pager Power charts for the receptors are shown below and on the following pages. Each chart shows:

- The receptor (observer) location – top right image. This also shows the azimuth range of the Sun itself at times when reflections are possible. If sunlight is experienced from the same direction as the reflecting panels, the overall impact of the reflection is reduced as discussed within the body of the report;
- The reflecting panels – bottom right image. The reflecting area is shown in yellow. If the yellow panels are not visible from the observer location, no impact will occur in practice. Additional obstructions which may obscure the panels from view and are considered separately within the analysis;
- The reflection date/time graph – left hand side of the image. The blue line indicates the dates and times at which geometric reflections are possible. This relates to reflections from the yellow areas;
    - The sunrise and sunset curves throughout the year (red and yellow lines).

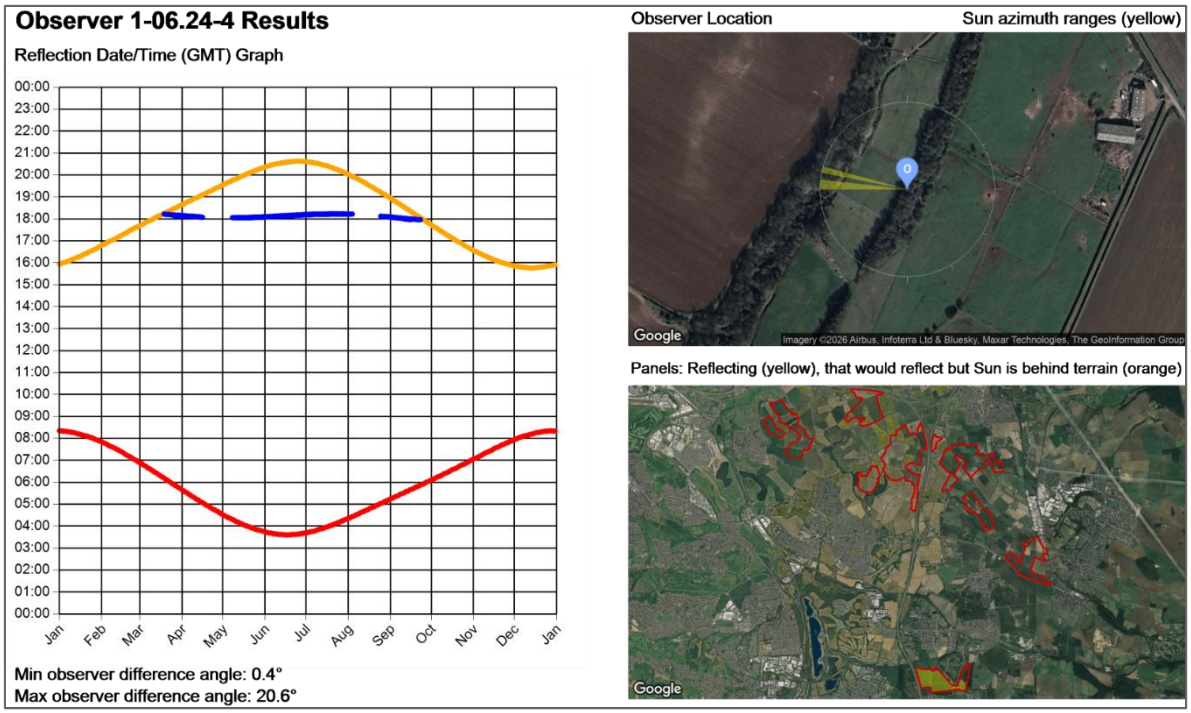
The Forge charts for the receptors are shown on the following pages. Each chart shows:

- The annual predicted solar reflections;
- The daily duration of the solar reflections;
- The location of the proposed development where glare will originate;
- The calculated intensity of the predicted solar reflections.

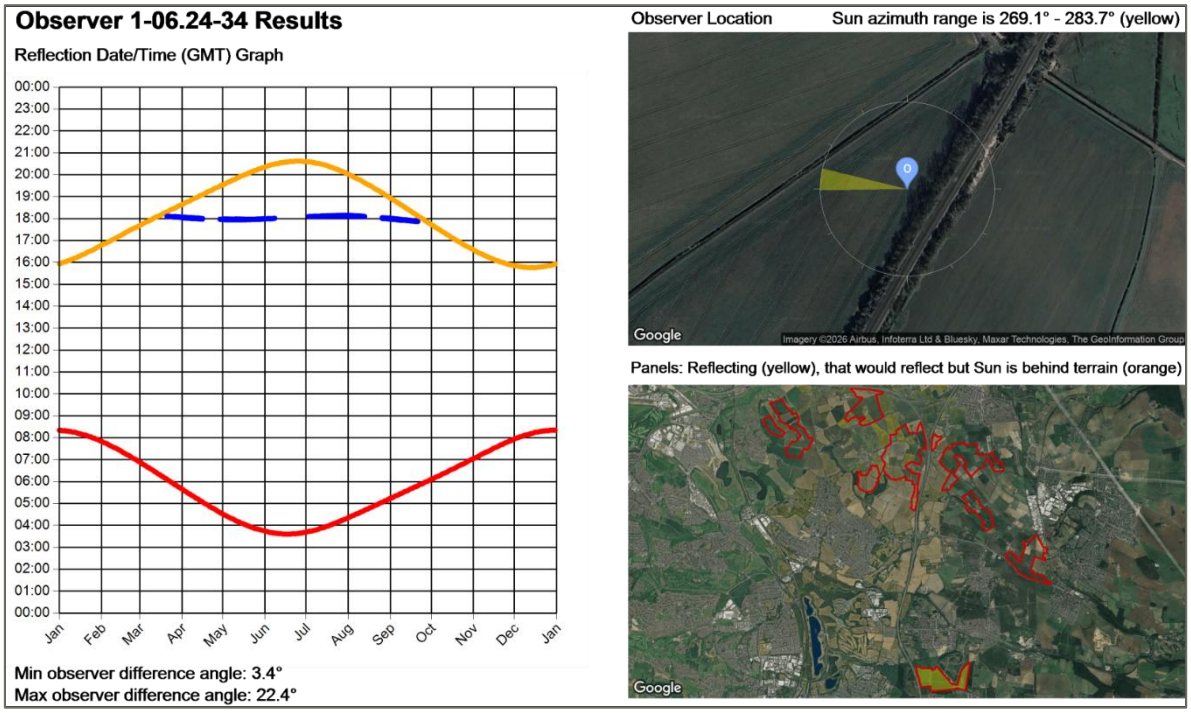
Results are shown for a sample of key receptors. Full modelling results are available upon request.

Circuit: 06RH/24LH

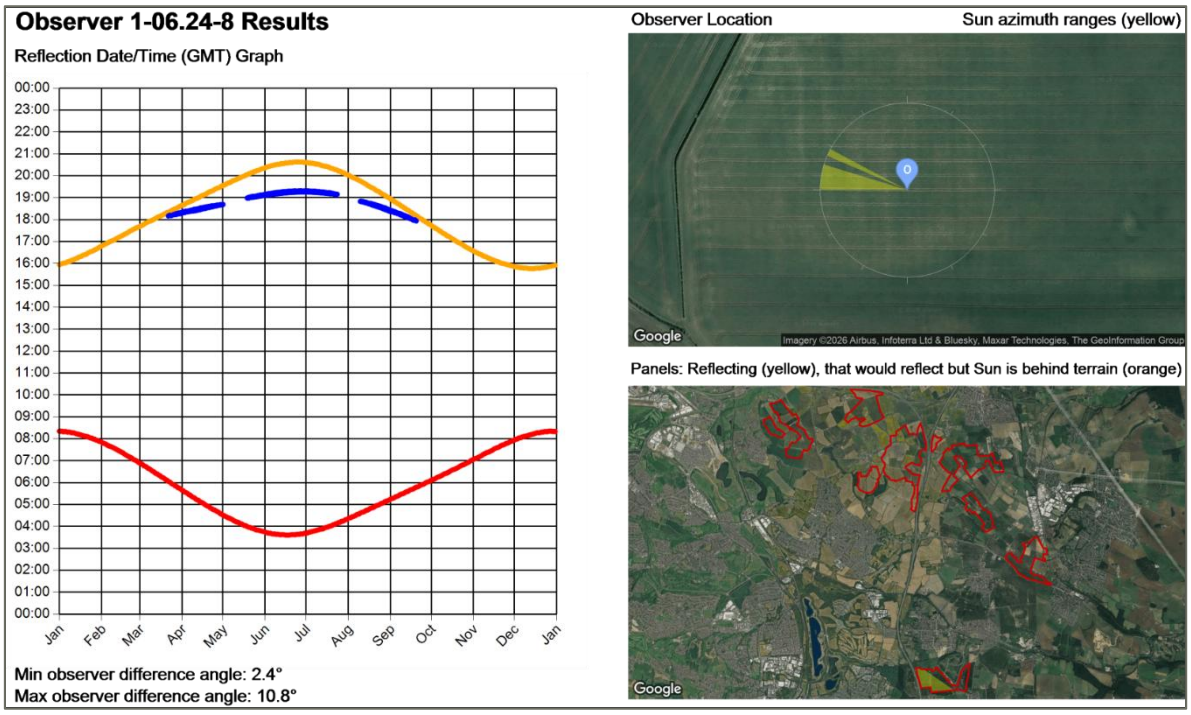
Pager Power Modelling



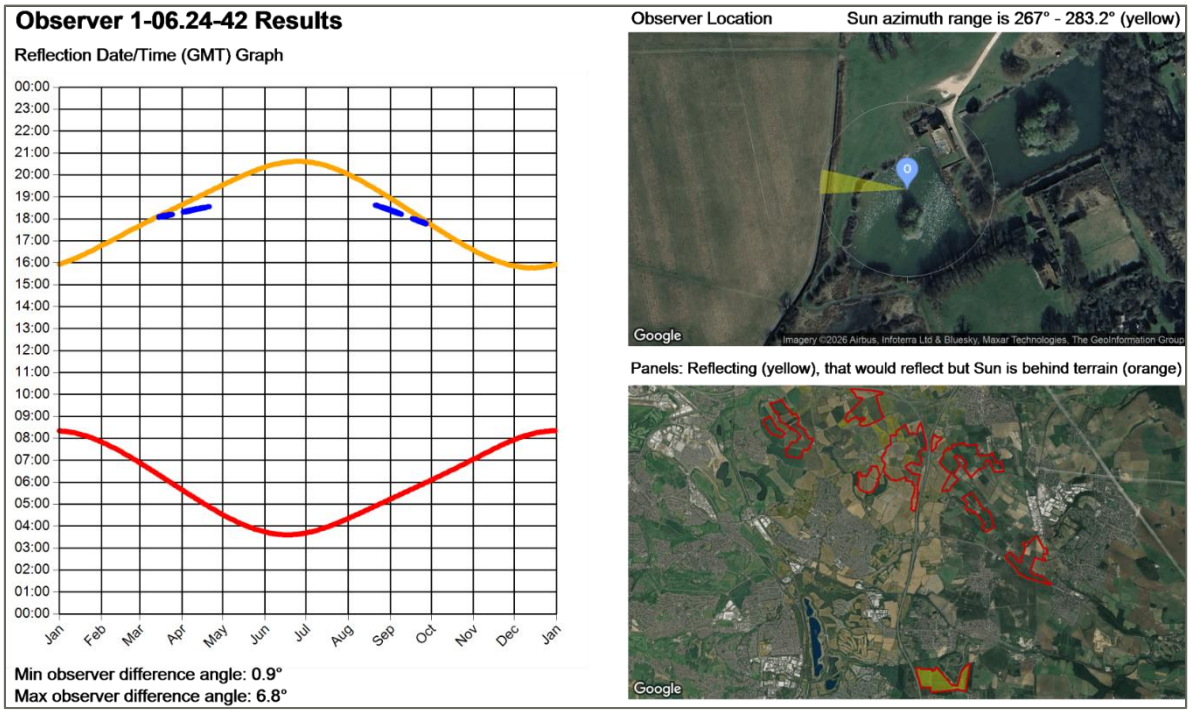
25 degrees



25 degrees

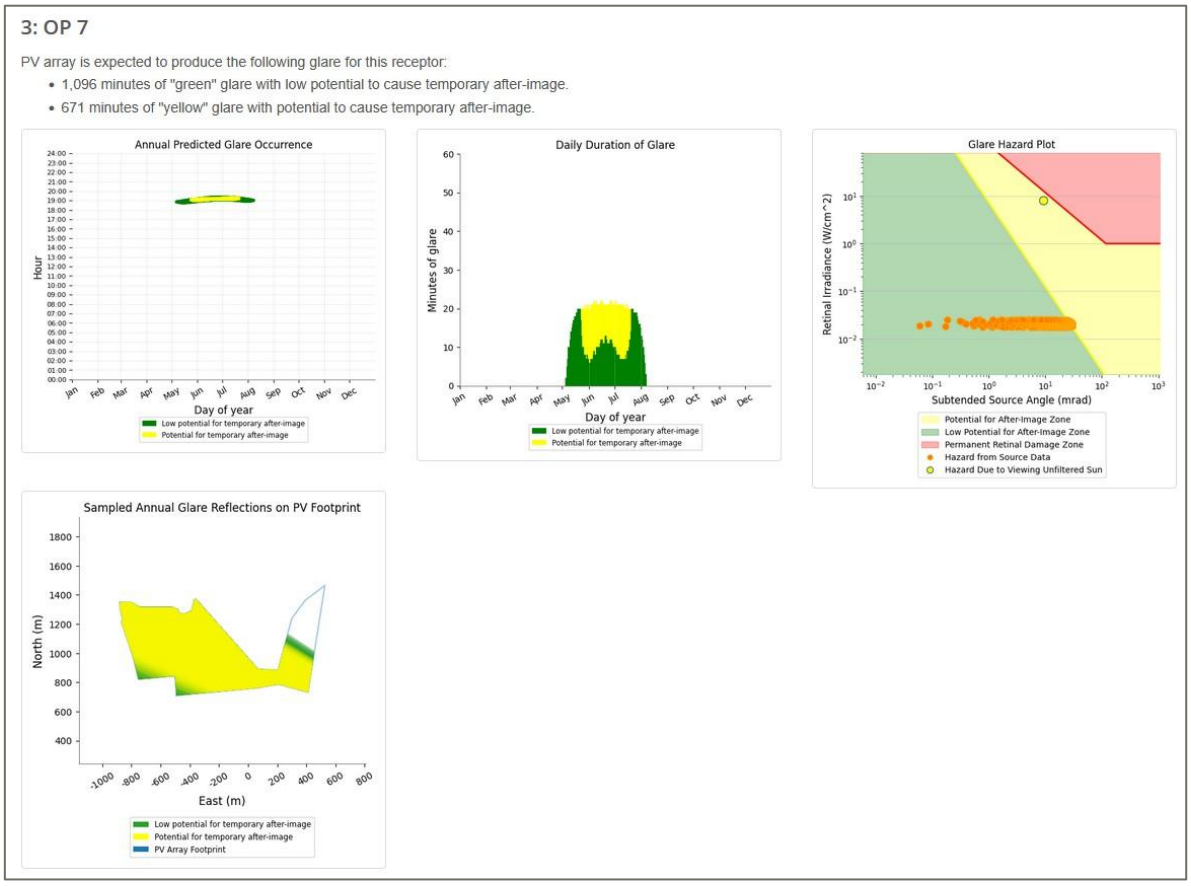


8 degrees

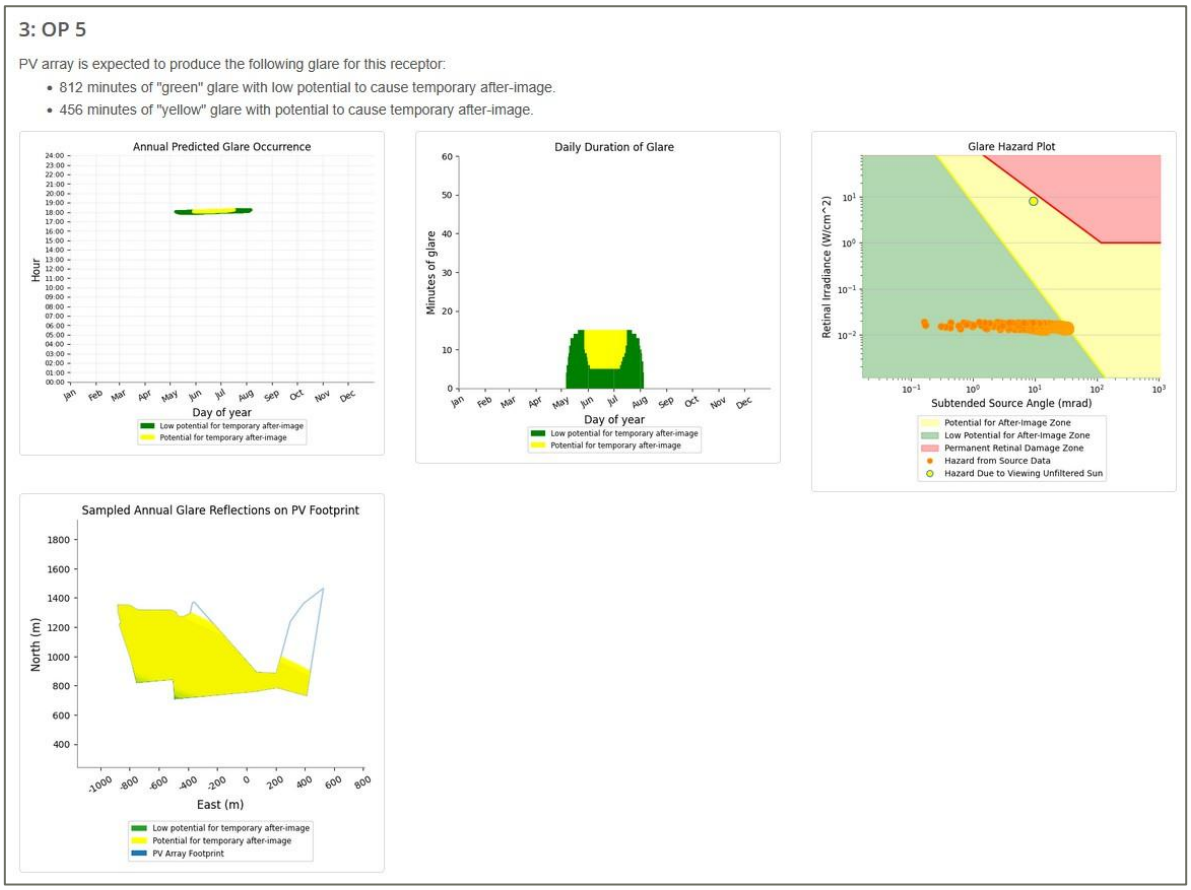


8 degrees

ForgeSolar Modelling



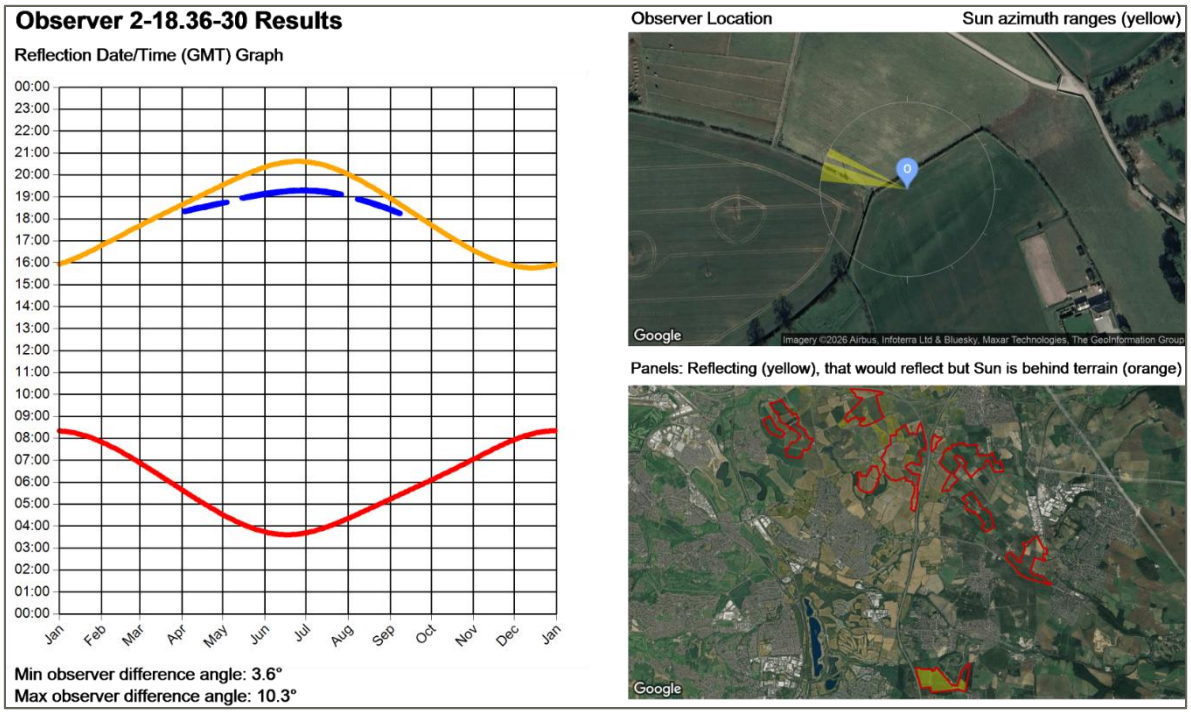
Area 3 – 8 degrees – without anti-reflective coating



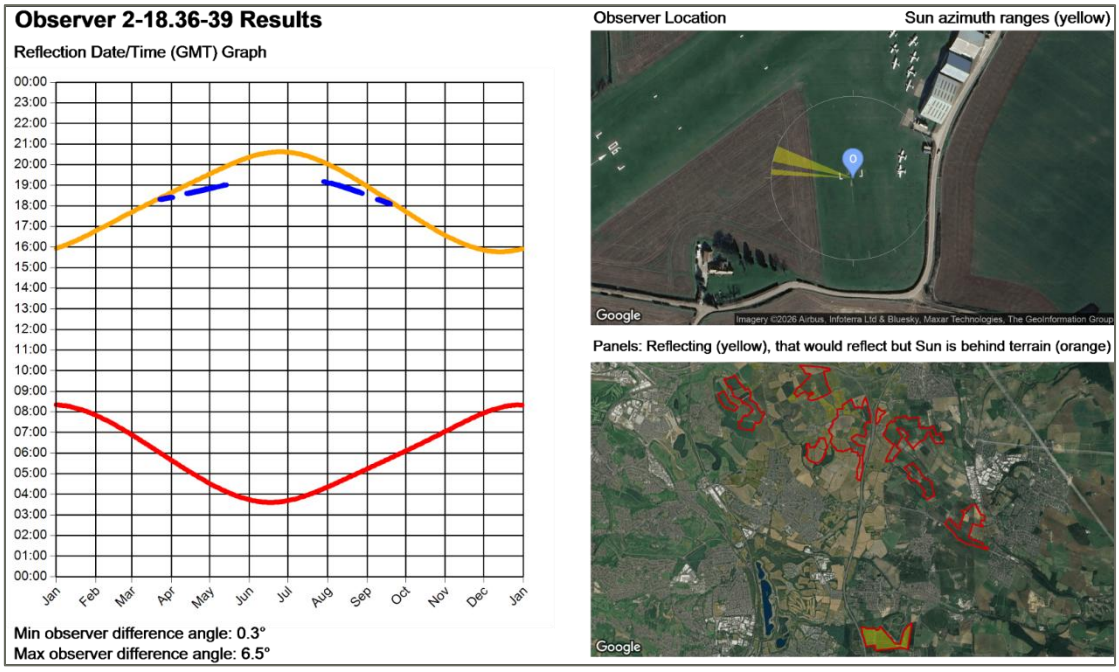
Area 3 – 25 degrees – without anti-reflective coating

Circuit: 18LR/36RH

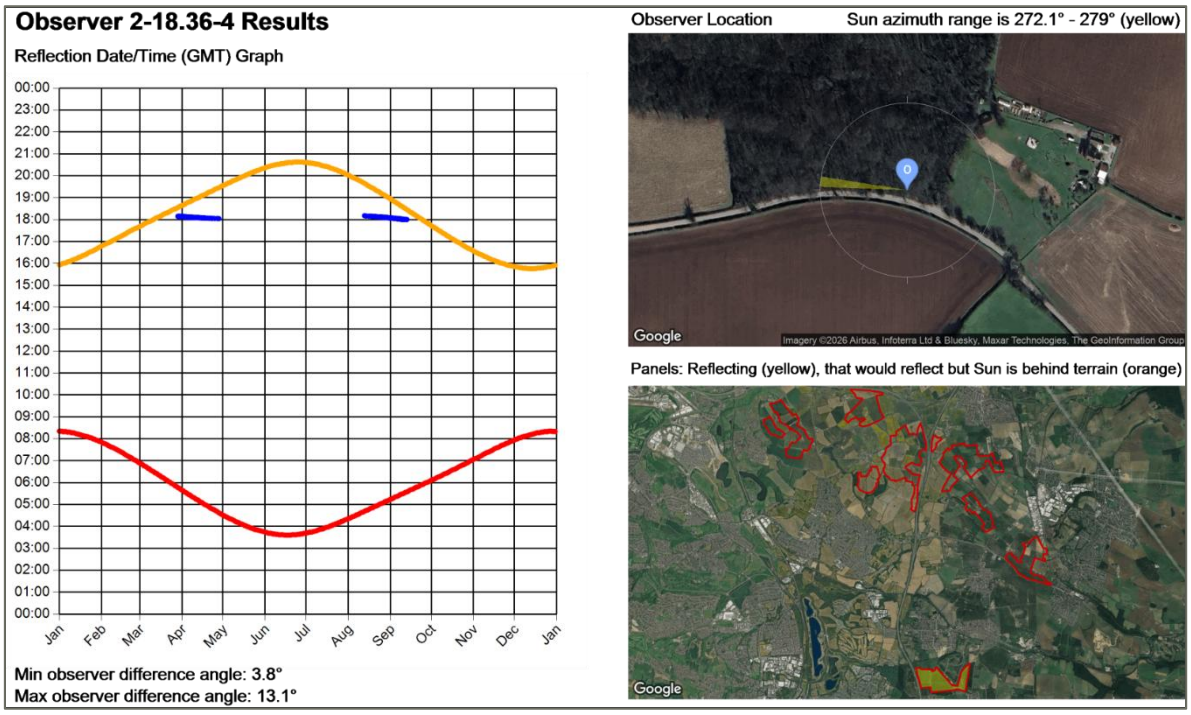
Pager Power Modelling



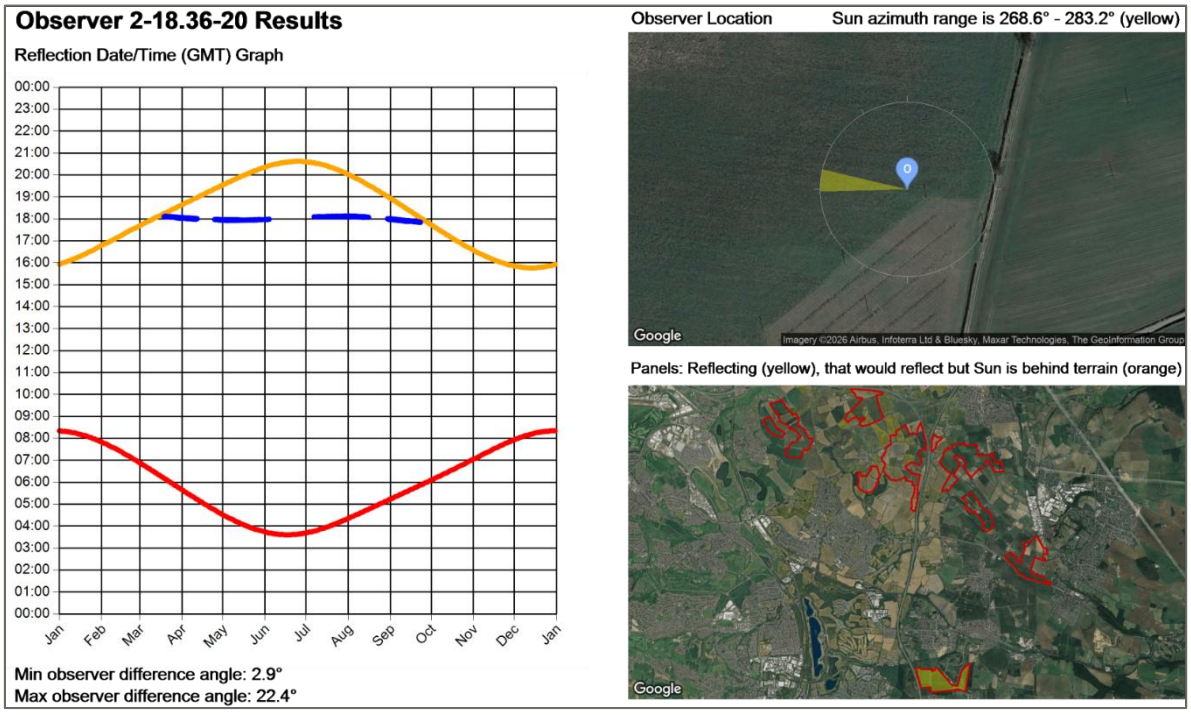
8 degrees



8 degrees

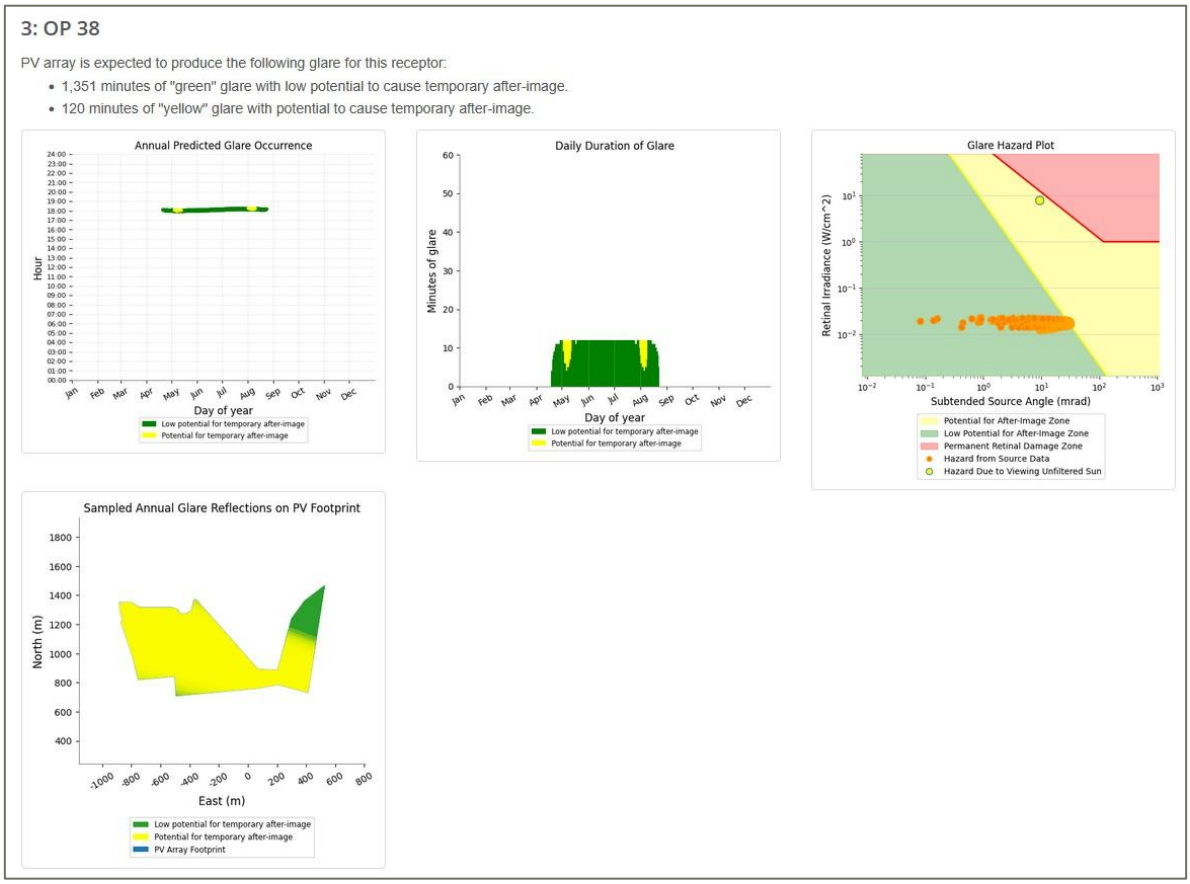


25 degrees



25 degrees

ForgeSolar Modelling



Area 3 – 25 degrees – without anti-reflective coating



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